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Incorporating Food Industries Weekly

...RD HILL LIMITED, STRATFORD HOUSE, 9 EDEN STREET, LONDON, N.W.1 MAY 1, 1955

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"*Well, you can see for yourself the trouble*," he said, with a sweep of his hand. "*Hold-ups here — hold-ups there. We just can't keep the stuff moving.*"

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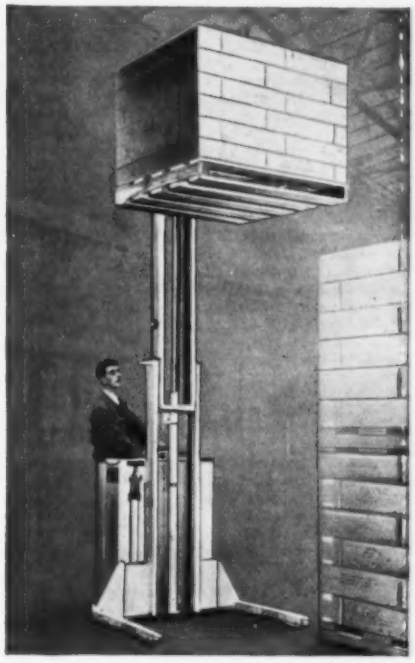

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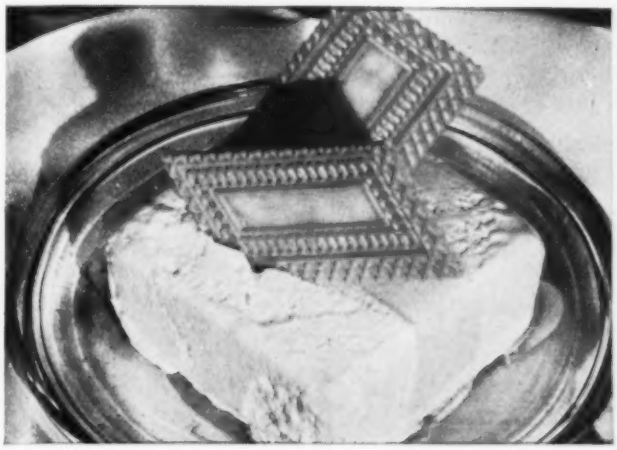

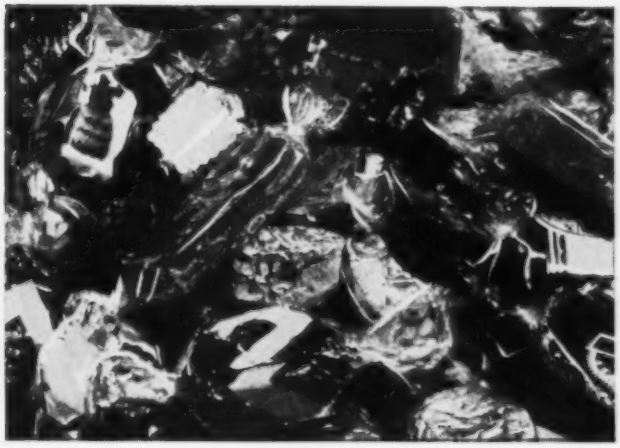

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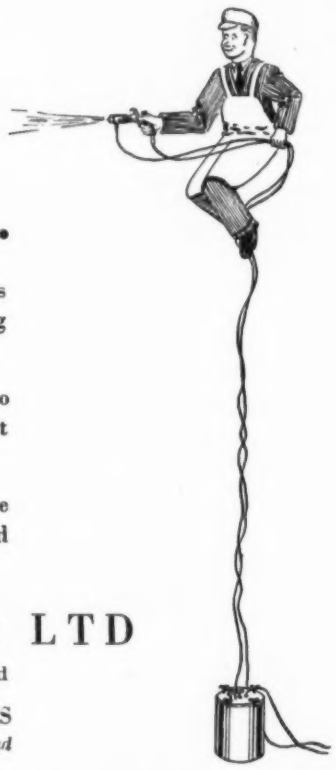

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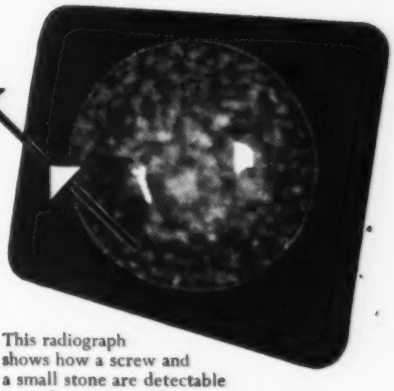

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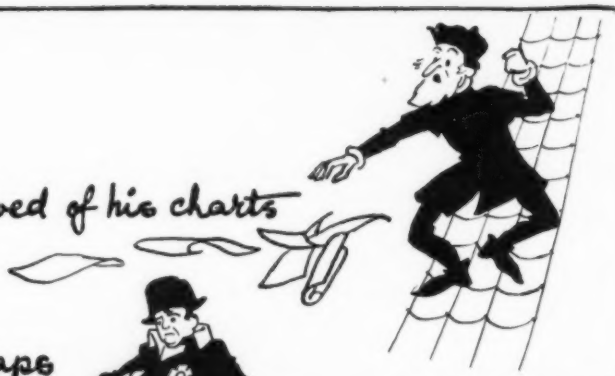
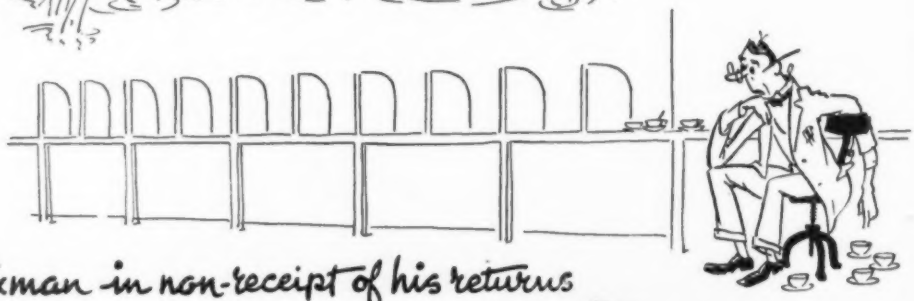


or Napoleon minus his maps

or Izaak Walton parted from his fly-book



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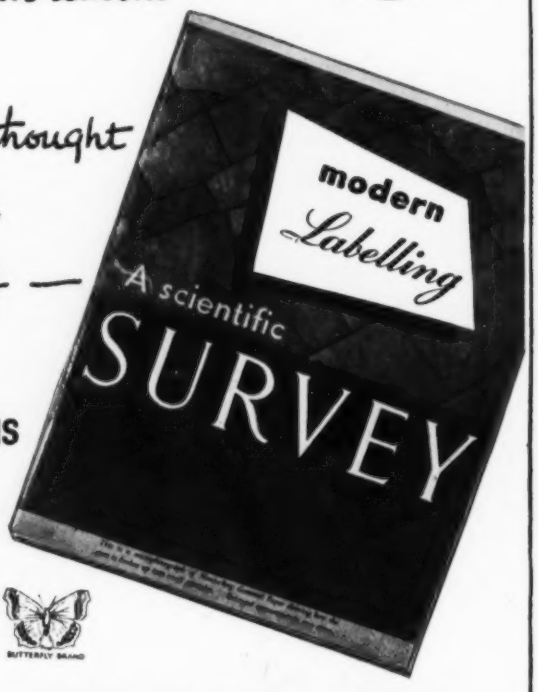

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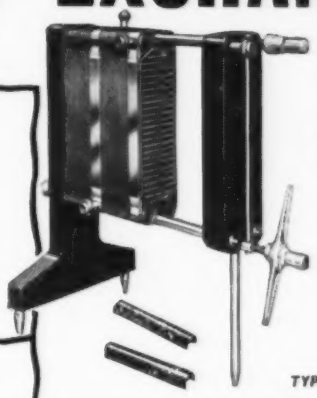

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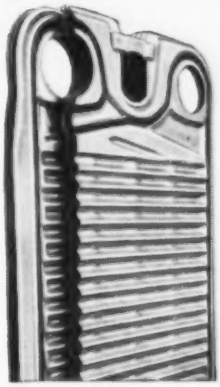

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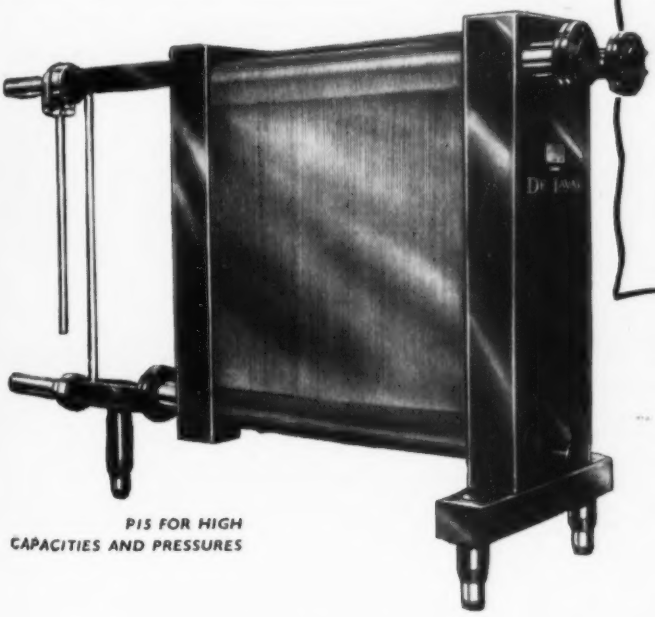
Special features of
DE LAVAL HEAT EXCHANGERS

★ Sturdy heavy guage stainless plates
★ Deep gasket grooves, giving leak proof operation at high pressures
★ Easily and quickly cleaned without dismantling



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also for

Pasteurising fruit juices and wine—Cooling vinegar wort and heating vinegar—Heating and cooling gelatine—Heating starch milk—Cooling Protein slurry—Condensing and cooling distillate—Pre-heating still feeds—Heating and cooling viscose—Cooling waste sulphite liquor—Pasteurising penicillin media Etc Etc

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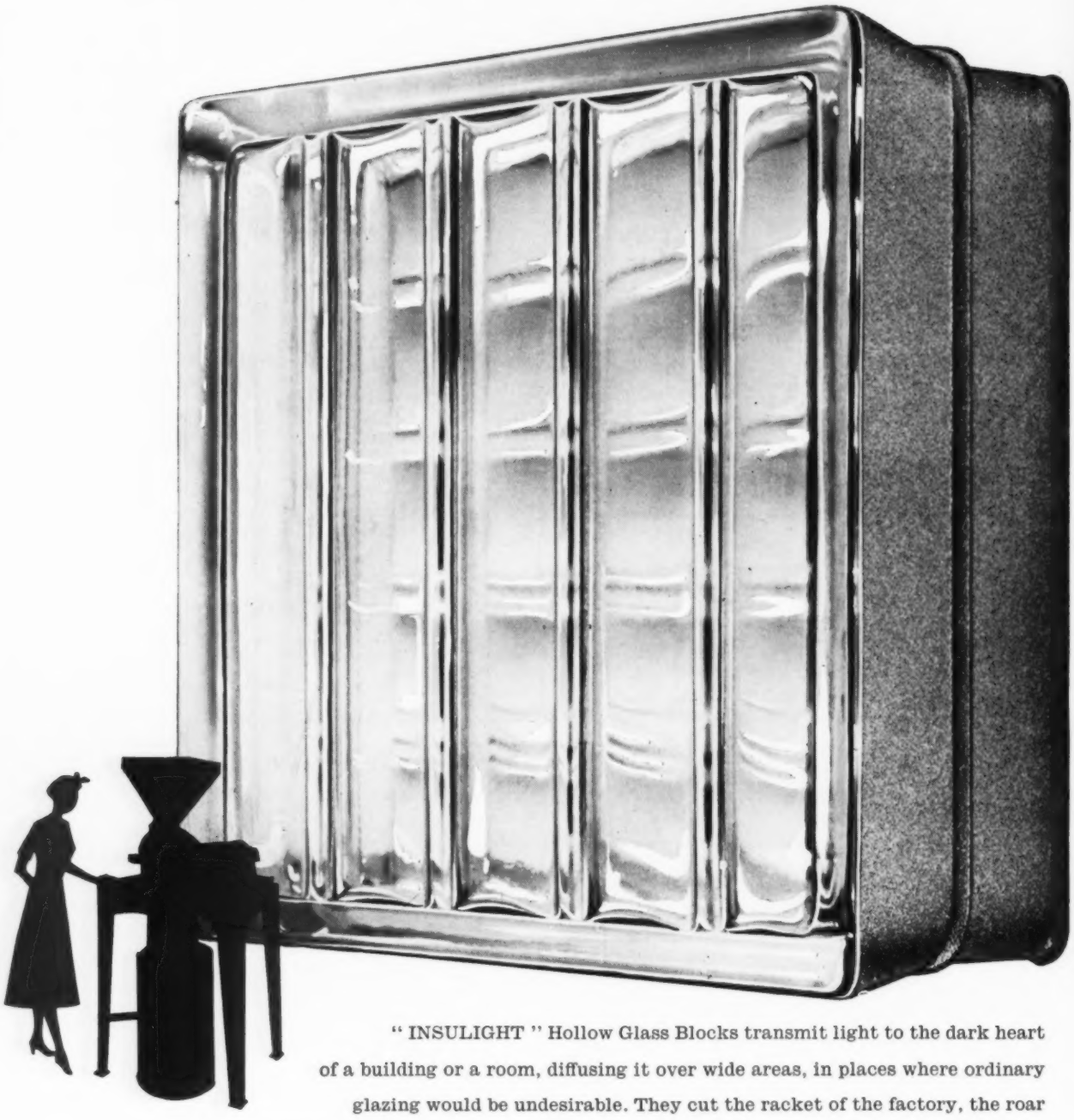

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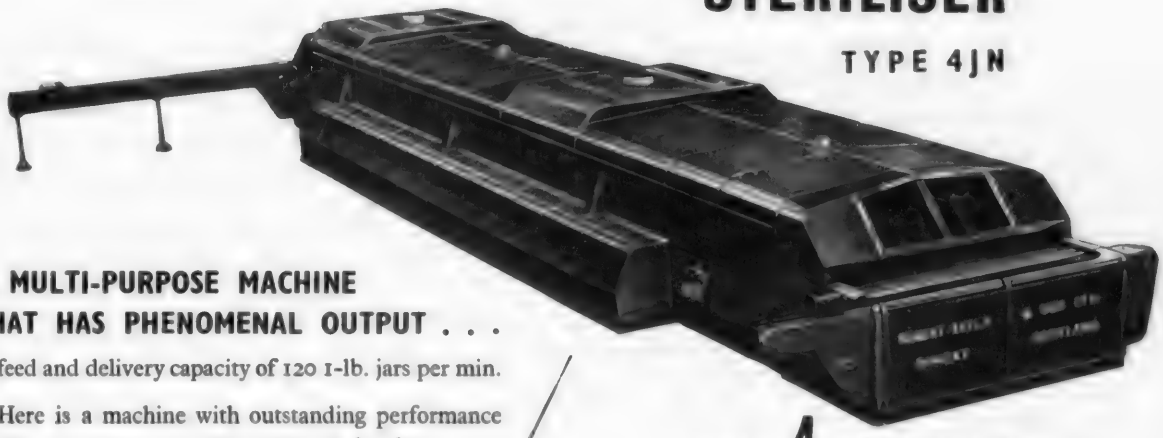

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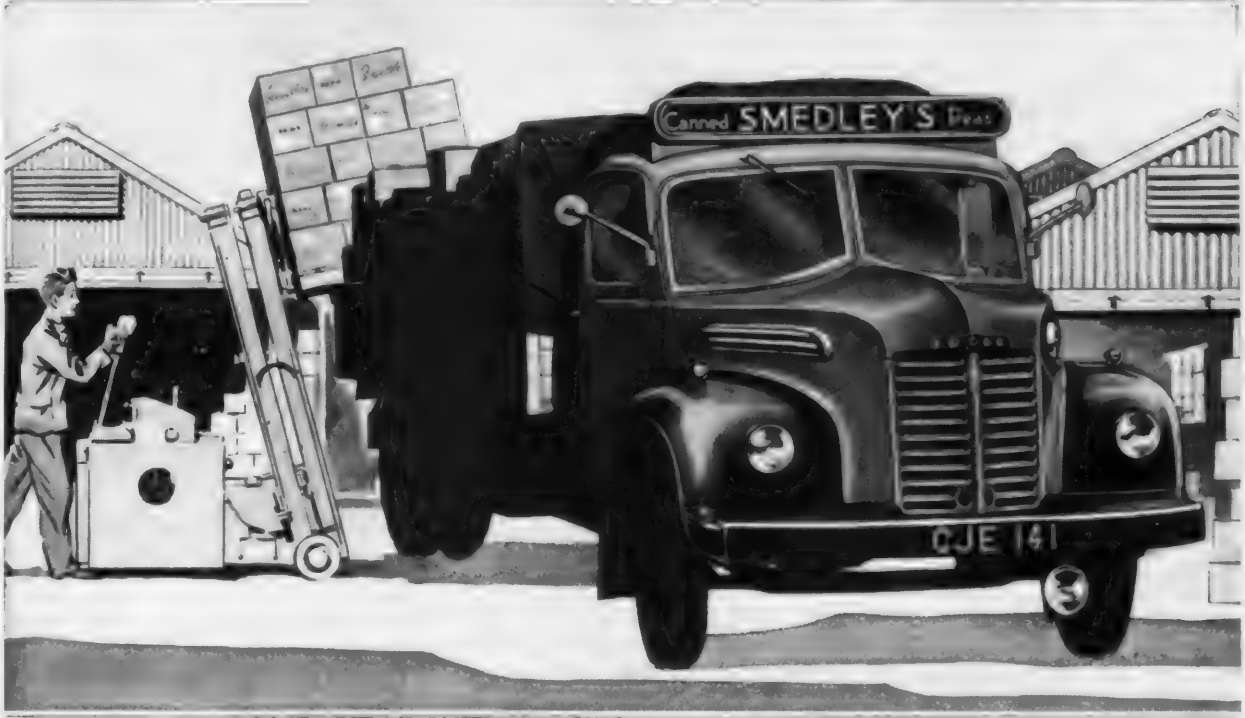

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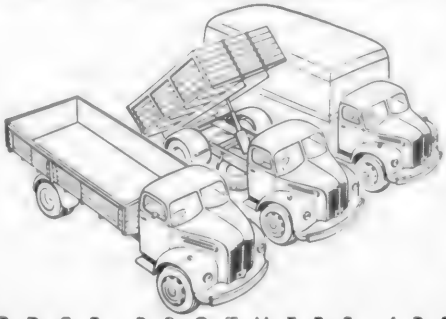

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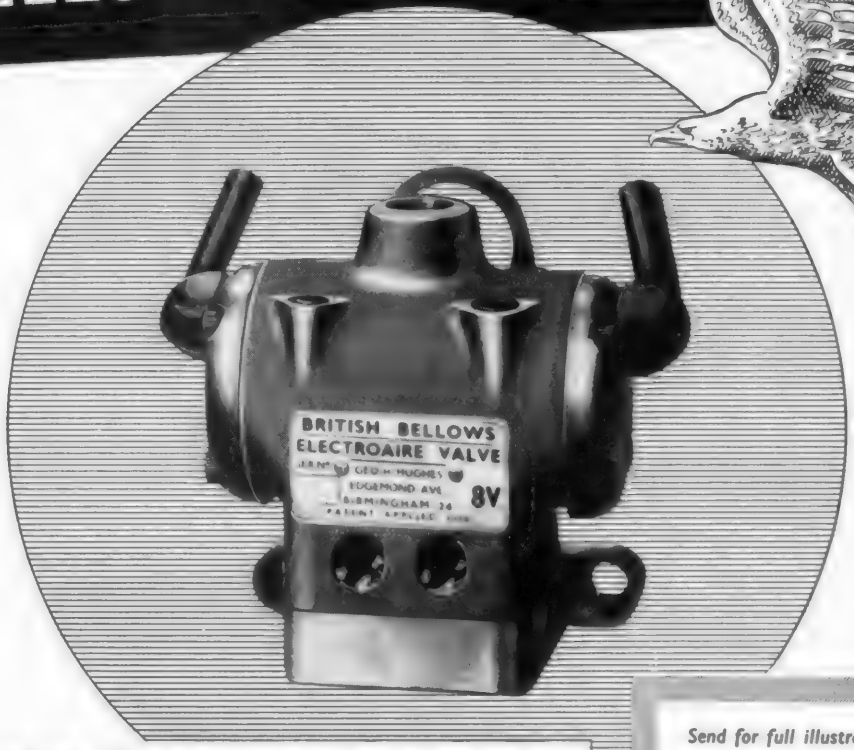

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I'm a Busy Little Bee from G.E.C.

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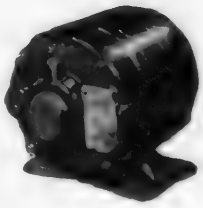

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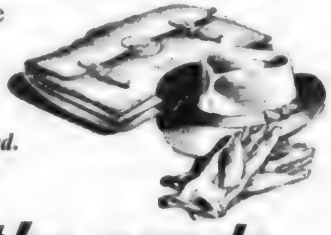

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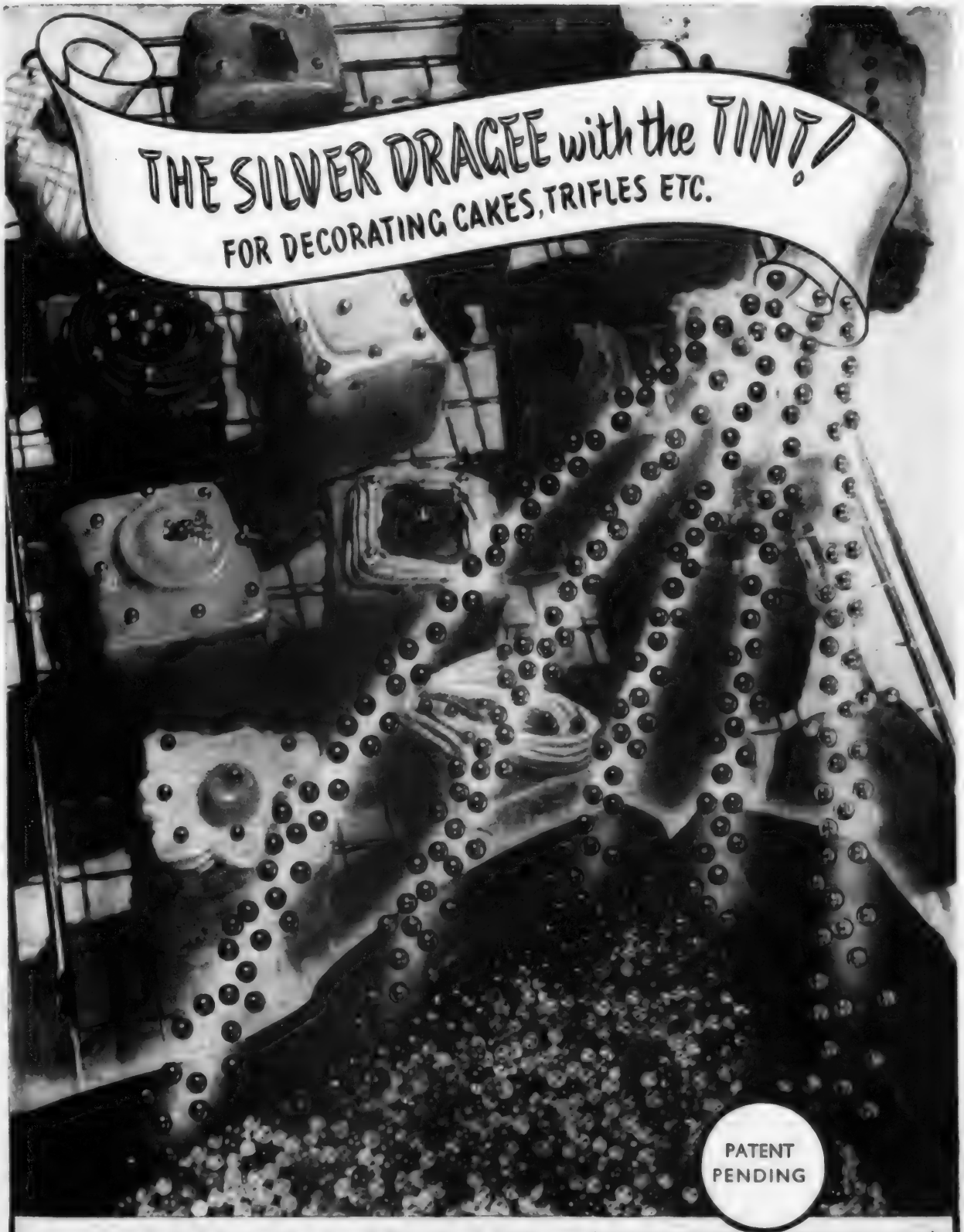

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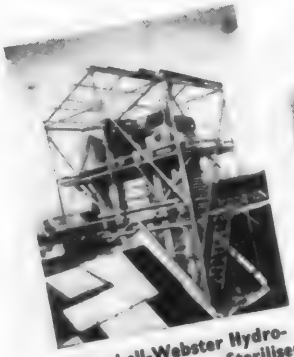

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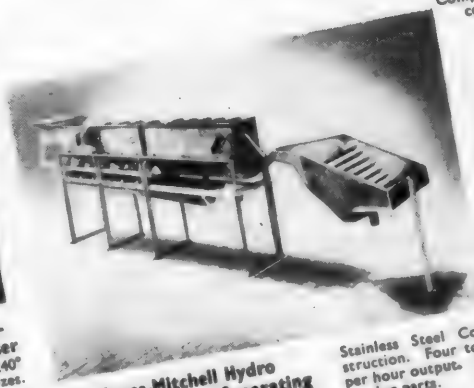
High temperature operation (240°—250°F). Wide range of can sizes. Outputs up to 600 CPM.



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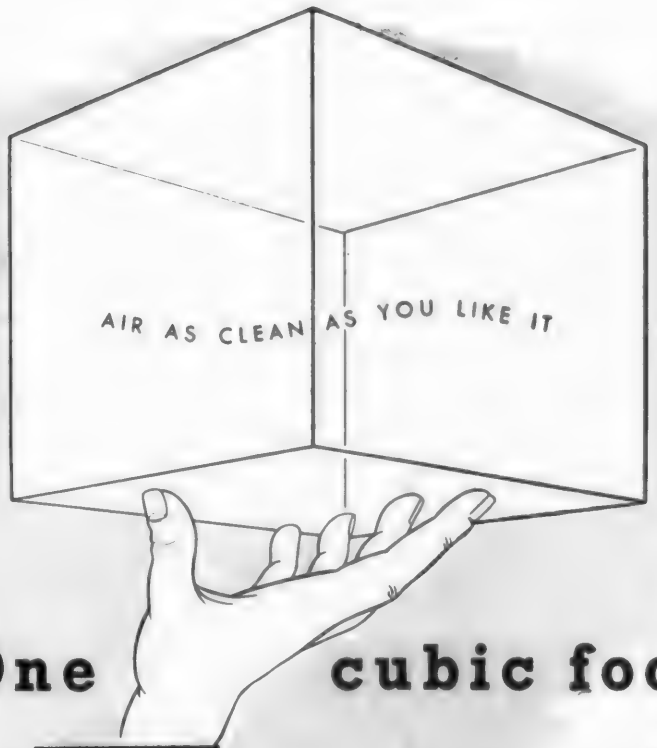

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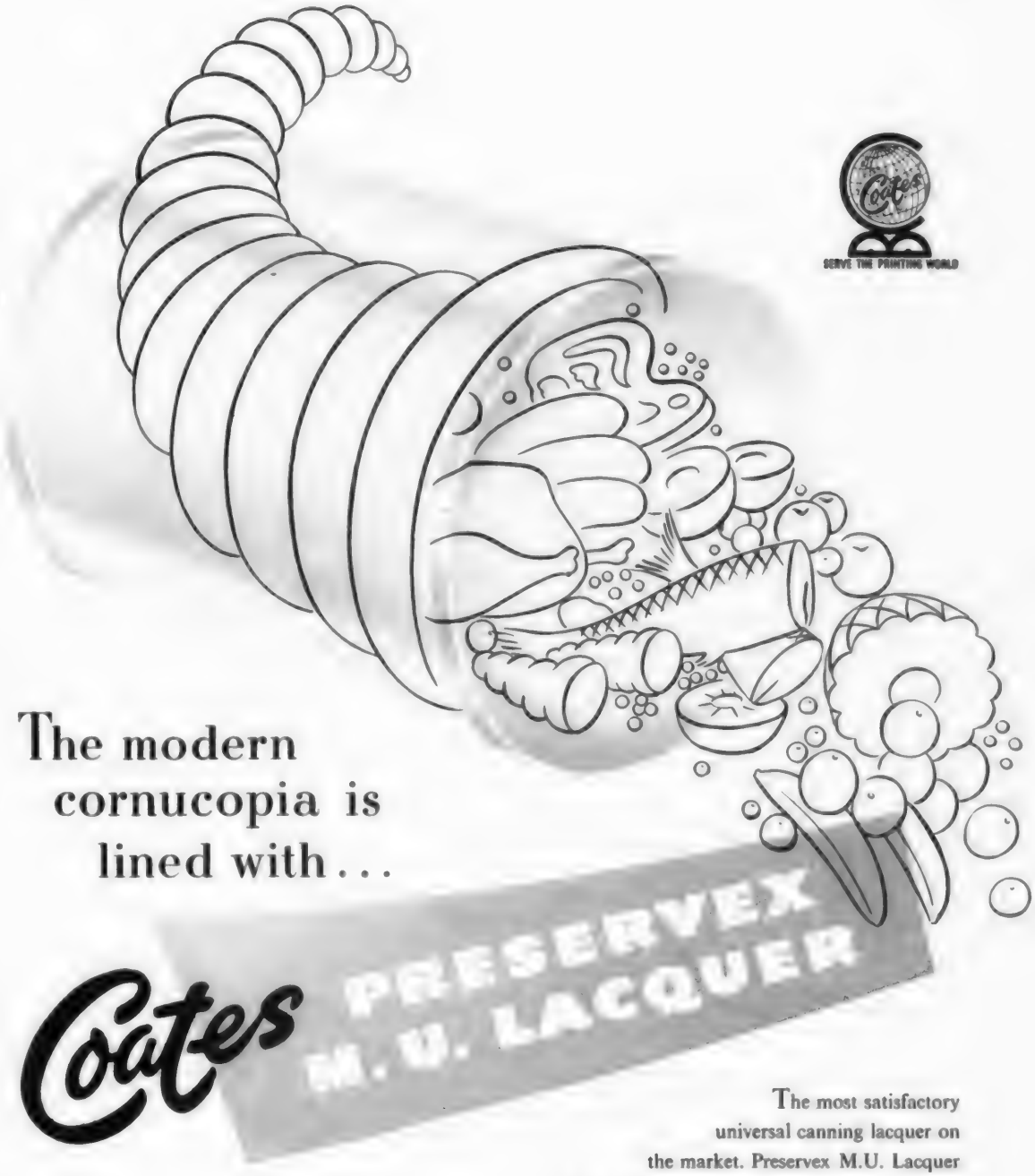

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Ep. 1

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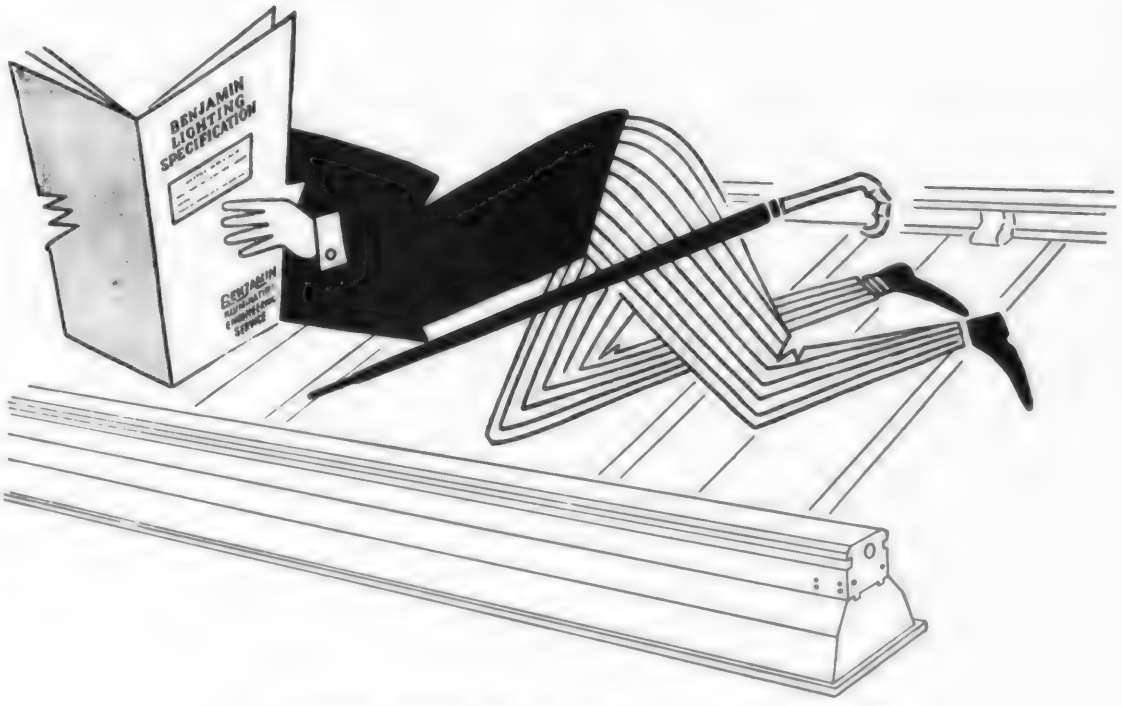

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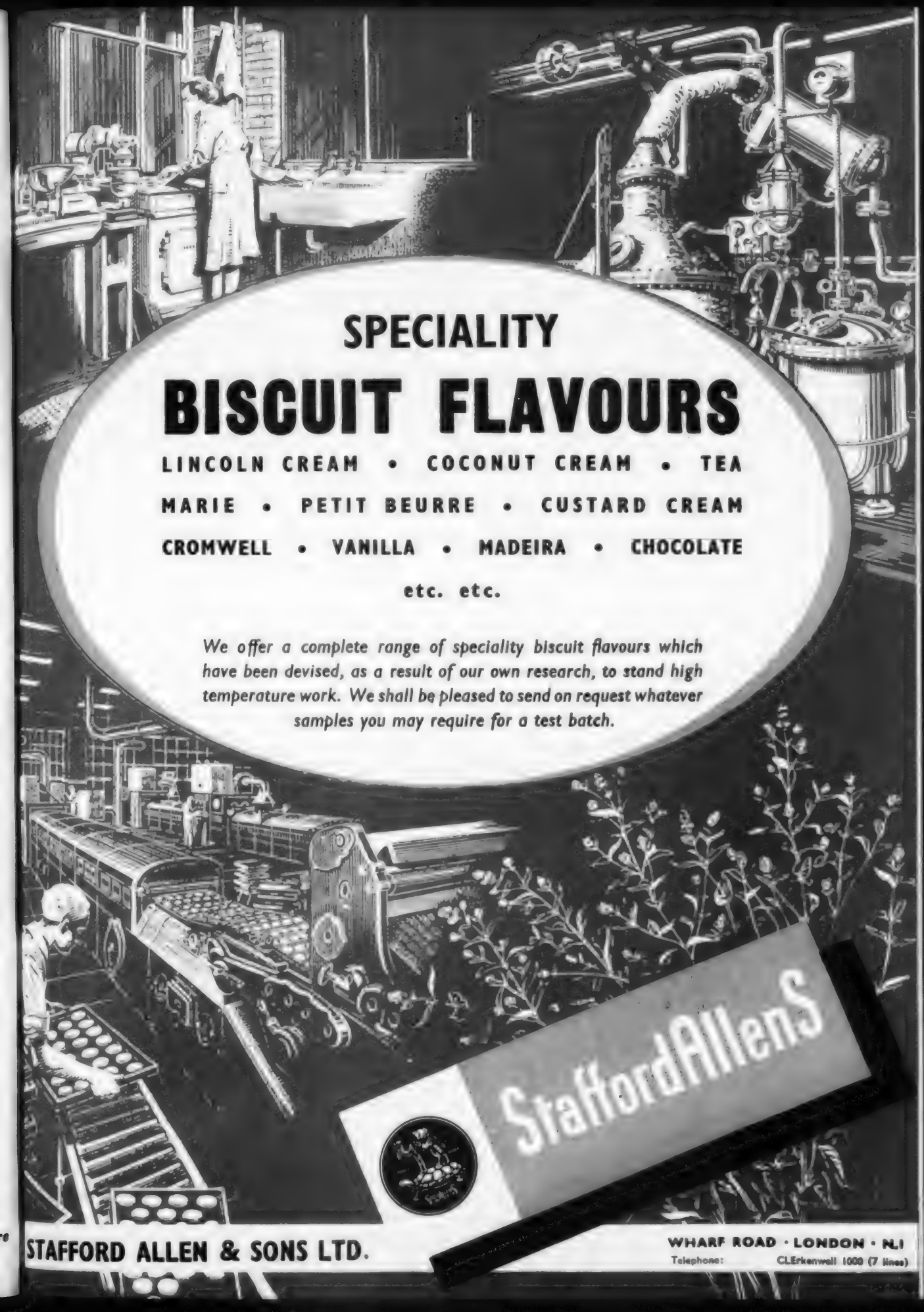
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FOOD RAPIDLY AND HYGIENICALLY PROCESSED THE BROADBENT WAY

To process modern foods economically, effectively and with maximum output, insist on installing BROADBENT HIGH-SPEED CENTRIFUGALS. The extensive range covers numerous applications and the prepared food retains its original flavour and purity as suitable corrosion resisting materials are used.

THOMAS BROADBENT & SONS LIMITED

In use all over the world by large and small users

CONSTANT PROCESSING

C.P. are specialists in high standard finish Stainless Steel, continuous and batch processing patented equipment (controlled heating, cooling, mixing and aeration), for most kinds of food products.

MULTI-PASS PLATE EXCHANGERS
CAPACITIES H.T.S.T. Pasteurising 100-2,500 IMPERIAL G.P.H. and corresponding increases for heating and cooling duties.

Incorporating the patented detachable seals (non-toxic) with flat stainless steel heat exchange plates. It is the most advanced development in heat exchange design ensuring a most efficient heat exchange at low pressures, enabling hygienic cleaning to be carried out more easily than on any other plate heat exchanger. The frames are stainless or mild steel construction.

MULTI-PROCESS STAINLESS STEEL VATS
Capacities 50-500 IMPERIAL G.P.H.

The perfected hygienic vat for mixing, heating, cooling or pasteurising liquid food products. Special thermostat control and scientific insulation enables temperatures to be maintained over long periods accurately and economically.

FAT CHILLING AND PLASTICISING MACHINES
OUTPUT CAPACITIES VARY ACCORDING TO THE FATS AND TEMPERATURE RANGE

Three sizes of machines available producing 15 cwt.-35 cwt. per hour. For chilling, blending and intensive mixing of fats this machine offers continuous production in place of batches. No mess, no handling, perfect hygiene. Accurate control giving a fine and constant texture—in short all advantages which will improve the product and greatly lower production costs.

MARSHMALLOW AND FILLING PROCESSORS
APPROX. CAPACITIES FROM 450 lbs.-1,500 lbs. PER HOUR

Ideally suitable for heat exchange and mixing duties of viscous materials, excellent for cooling and blending caramel and similar fillings for the confectionery industry.

MULTO-FLO HOMOGENIZERS CAPACITIES 100-1,000 IMPERIAL G.P.H.

This outstanding modern unit ensures uniform dispersion of the molecules of solid throughout the solution. Economic in operation and easy to clean. The expendable patented C.P. Single Service Valve made of single stainless steel wire compressed into a cone, with the three-cylinder pump and stainless steel rams, ensures efficient dispersion at low working pressures with minimum of maintenance and operating costs.

SABROE SOFT ICE MACHINES
PRODUCING UP TO 1,540 lbs. PER HOUR ICE

Provides a continual supply of chilled water at 32 F. even at peak loads.

DUPLEX CIRCULAR STAINLESS STEEL PLATE FILTERS

A first-class filter with outputs from 2,000-20,000 lbs. per hour depending on product range and application.

ROTO-SEAL F.M.B. STAINLESS STEEL CENTRIFUGAL PUMPS

Capacities of these universally used 1½ in. bore pumps are up to 2,400 Imperial G.P.H. at 24 ft. head. The perfect pump at the right price.

IN-THE-LINE FILTERS (3 in. and 6 in. diameter)
RANGE OF CAPACITIES UP TO 5,000 lbs. ACCORDING TO APPLICATION

Other equipment supplied specifically for the food and allied trades include stainless steel concentrate tanks, storage tanks and all types of pressure vessels, positive displacement pumps, sanitary piping and fittings, sundry equipment and utensils, etc.

Fully illustrated Leaflets showing applications of equipment sent on request, write now to

THE CREAMERY PACKAGE MFG. COMPANY LTD.
MILL GREEN ROAD · MITCHAM JUNCTION · SURREY
Telephone: Mitcham 2981/2/3 Telegrams: "Seedyko, Mitcham"

The COMMER 1¼ ton
Forward Control ALL-STEEL VAN

50 B.H.P ENGINE WITH LONG LIFE POROUS CHROME BORES

FOUR-SPEED SYNCHROMESH GEARBOX

TELESCOPIC HYDRAULIC DAMPERS FRONT AND REAR

FLUSH FITTING SLIDING DOORS

ALL-STEEL CONSTRUCTION OVER 300 CU. FT. CAPACITY

for efficient LOCAL DELIVERY work

Here is a sturdy all-steel van with success written all over it—your success! With its smart appearance and businesslike finish it will carry your prestige proudly through the streets, whilst its sound practical design will give remarkably long life and low operating cost.

Send for a brochure TO-DAY

Smart and functional!

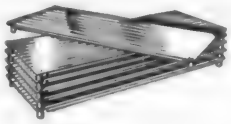
COMMER

A PRODUCT OF THE ROOTES GROUP

COMMER CARS LTD. LUTON BEDS. EXPORT DIVISION: ROOTES LTD. DEVONSHIRE HOUSE PICCADILLY LONDON W.1

The CHIEF ENGINEER says—

'Strong-light-clean-smooth-easy stacking WARWICK has everything'



Stacking Containers

Range now extended: **CS.24157—23½" × 14½" × 7¾"**
CS.24155—23½" × 14½" × 5½"
CS.24153—23½" × 14½" × 3½"

Strong Alloy One Piece Pressings. *All sizes will interstack*

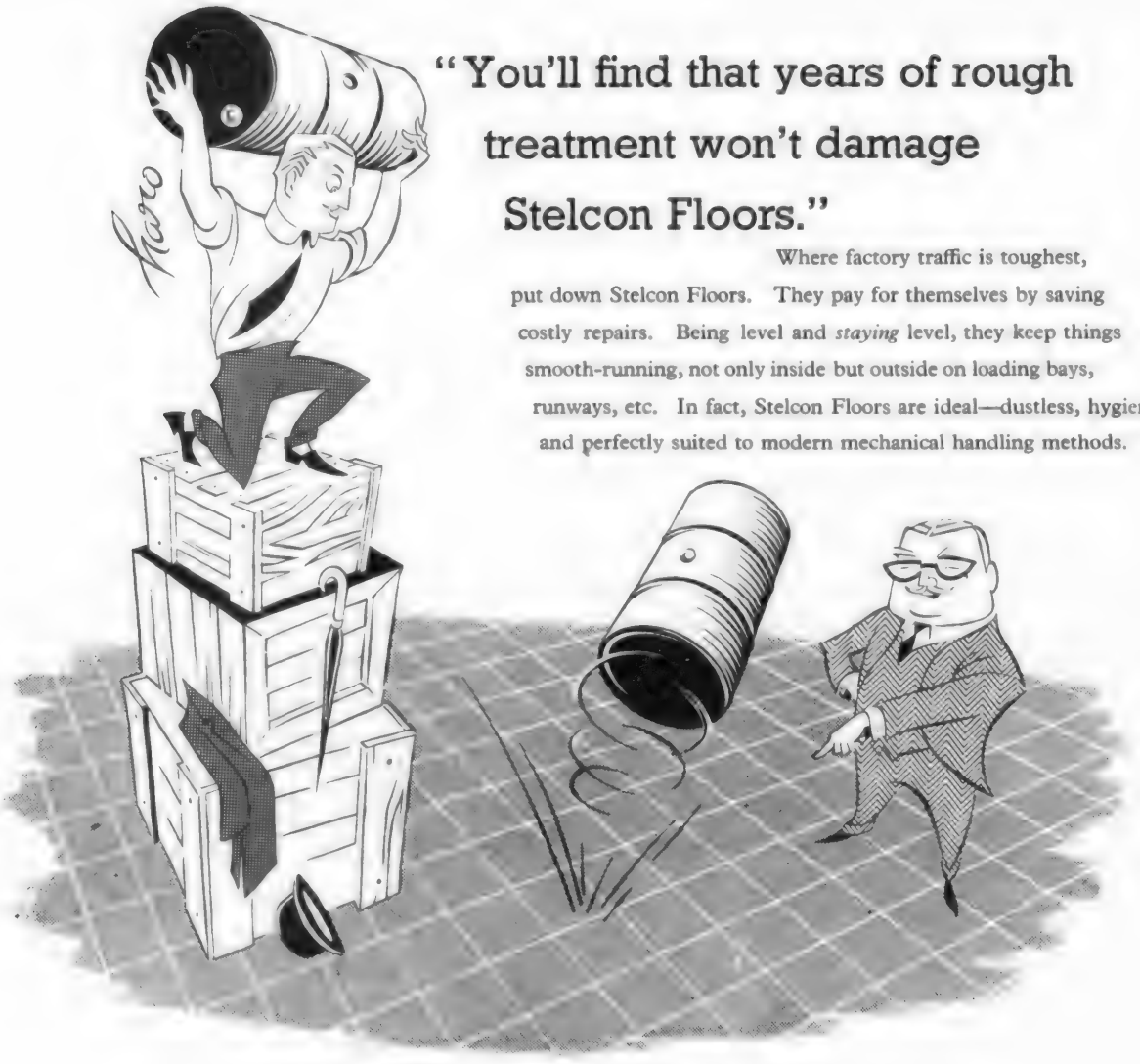
- ★ Absolutely hygienic and easy to clean
- ★ Exceptionally strong rim obviating handles
- ★ Positive stacking by extra deep swage
- ★ Available with or without base drainage holes
- ★ Larger size in 16 gauge, smaller size 18 gauge Aluminium Alloy
- ★ Lids also available, common to both sizes

Other effective depths between 3½" and 7¾" can be offered in 16 gauge or 18 gauge providing reasonable quantities are required.

WARWICK PRODUCTION COMPANY LTD

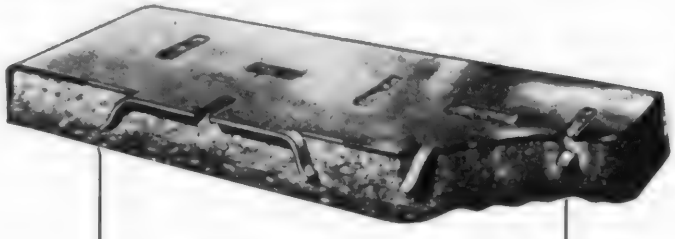
IN ASSOCIATION WITH **ALMIN LIMITED** FARNHAM ROYAL BUCKS

BIRMINGHAM ROAD, WARWICK **TELEPHONE: WARWICK 693-696**



"You'll find that years of rough treatment won't damage Stelcon Floors."

Where factory traffic is toughest, put down Stelcon Floors. They pay for themselves by saving costly repairs. Being level and *staying* level, they keep things smooth-running, not only inside but outside on loading bays, runways, etc. In fact, Stelcon Floors are ideal—dustless, hygienic and perfectly suited to modern mechanical handling methods.



You'll find

Stelcon

FLOORS

in every industry

—everywhere

Stelcon Anchor Steel Plates are what their name implies—steel anchored and bedded down in concrete. In fact, it would take a bomb to break up a Stelcon Floor!

STELCON (INDUSTRIAL FLOORS) LTD., CLIFFORD'S INN, LONDON, E.C.4. TELEPHONE: CHAncery 9341

For light, bright, lasting equipment to meet the highest standards of hygiene—

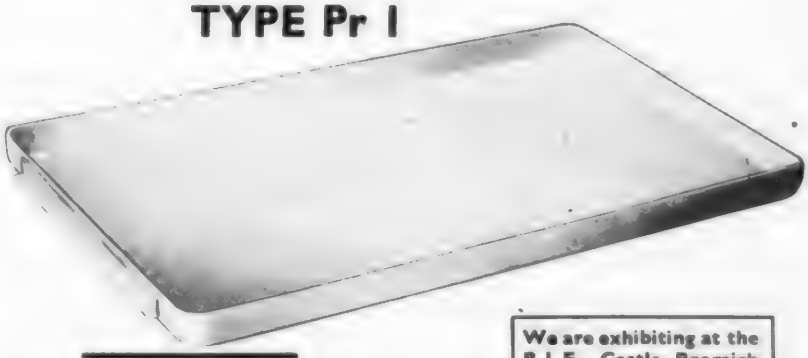
PHŒNIX HESTON EQUIPMENT CO. LTD *is the answer*

Phœnix Trays have been supplied to answer many specific requirements in the food and confectionery industries. In every instance their supreme fitness for the job has been proven in lighter work, easier cleaning, rigid interstacking and sturdy service.

ALUMINIUM PRESSED TRAYS

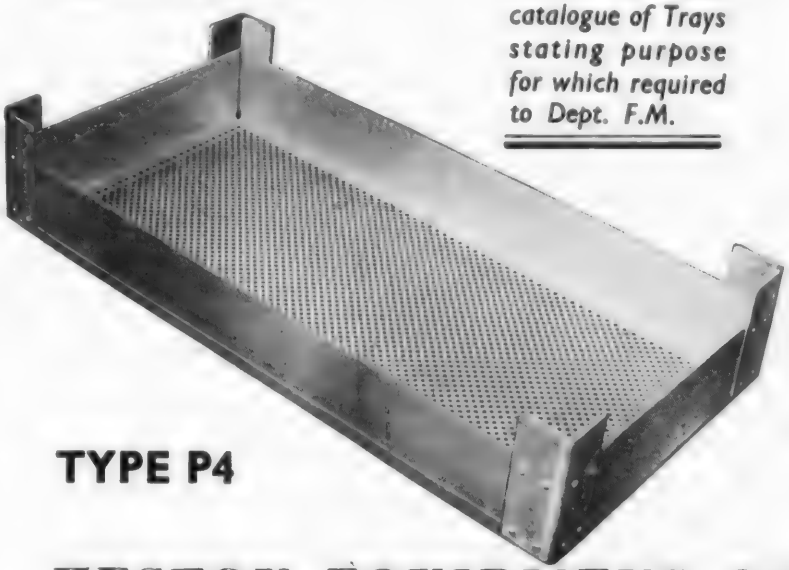
These trays have the great strength of high quality aluminium, plus the light weight that goes with it. Used widely for Biscuit and Cake processing, they have many other applications in manufacture when made to the dimensions required, with special features incorporated to customers' wishes. They can be made to interstack or not, and are the economical answer in hygiene, long service and easy cleaning.

TYPE Pr I



We are exhibiting at the B.I.F., Castle Bromich STAND No. D 345/240

Send for illustrated catalogue of Trays stating purpose for which required to Dept. F.M.



TYPE P4

A NEW *DIAMOND MESH* PERFORATED COOLING TRAY

Precision manufactured in highest grade aluminium with perforated base integral with sides and ends. Reinforced corner angles are designed for accurate interstacking, leaving lifting space between stacked trays for easy handling. Used for many purposes where cooling and hygiene are of paramount importance, e.g., Restaurant crockery trays; Processing with sugar confectionery; Nut sorting and a wide variety of other uses.

HESTON EQUIPMENT COMPANY LTD

1 BUCKINGHAM PALACE MANSIONS · LONDON · S.W.1

Works: Heston Airport, Middlesex. ***Telephone: SLOane 9934-5-6***

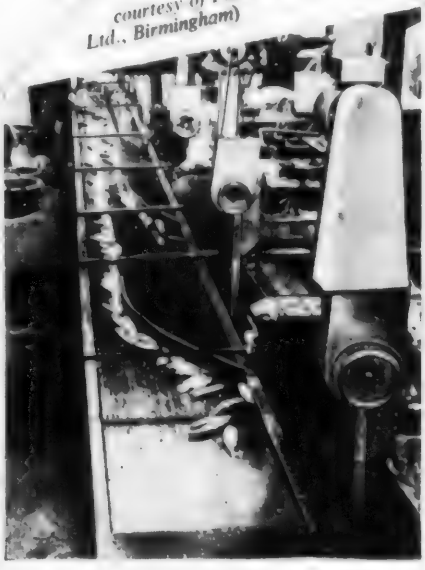
MEMBER OF THE HESTON GROUP OF COMPANIES

SCANDURA P.V.C. belting

helps the food industry

Cake packing on a 'Motaveyor' (by courtesy of Knightsbridge Cake Limited, Manchester)

Fruit bottling on a 'Motaveyor' conveyor (by courtesy of J. Mawdsley Ltd., Wigan)



Scandura conveyor in a fish canning factory (by courtesy of Fisher & Ludlow Ltd., Birmingham)

As the pioneers of P.V.C. covered conveyor belting British Belting & Asbestos have supplied their SCANDURA belting for many varied applications. Due to its resistance to contamination and its hygienic qualities SCANDURA has become the obvious choice for food conveyor belting. Its lasting qualities had already been proved in food factories two years before its first introduction in Britain's coal mines in 1948, and its fire resistant properties have brought a hitherto unknown safety margin where conveyor fire hazards originally existed. SCANDURA is available now, in varying widths and thicknesses to suit all applications.

SCANDURA P.V.C. BELTING IS MANUFACTURED BY **BBA**

BRITISH BELTING & ASBESTOS LIMITED · CLECKHEATON · YORKSHIRE

ONE *inexperienced attendant working with this*

BLISS HIGH-SPEED DOUBLE SEAMER

WILL PRODUCE 80 to 120 SQUARE OR IRREGULAR-SHAPED CANS

PER MINUTE!

- All the attendant has to do is feed the can ends into the magazine. The Bliss High-speed Double Seamer does the rest—
  - Can ends are fed to the Seamer *automatically*.
  - End feed is positively foolproof; only one end can be fed at a time; if end is not right side up, it is rejected *automatically*.
  - If no cover is fed, no can is fed. If cover is fed but no can, cover is used on next cycle. This is completely automatic; no one need watch the work.
  - The Seamer uses ends with *straight* flanges, eliminating the need for use, unless preferred, of more costly ends with started or curled flanges.
  - Seaming heads are available with either "clover leaf" seaming rolls or with specially-designed round rolls and developed cams.

Yes, everything about the Bliss Double Seamer has been designed for simple automatic operation. What's more, the seamer has been built for lasting performance with a modicum of maintenance: the rigid base and body structure . . . heavy-duty shafts, bushings and bearings mean years of trouble-free operation.

If you want dependable high-speed seaming, contact Bliss for complete details on this most modern double seamer.

E. W. BLISS (ENGLAND) **LTD., CITY ROAD, DERBY**

Telephone: DERBY 45801

London Office: 2/3 THE SANCTUARY, WESTMINSTER, S.W.1 Telephone: ABBEY 3651

B/32

BLISS on your machine is more than a name . . . *it's a guarantee!*

BLISS CAN AND CONTAINER MAKING MACHINERY

SLITTERS BODYMAKERS FLANGERS SEAMERS SCROLL SHEARS STRIP FEED PRESSES

Some of the 7,000 COLT *users*

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Batchelors Peas (Southall) Ltd.
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Coca-Cola Ltd.
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Crosse & Blackwell Ltd.
Roderick Dewar Ltd.
Dunhills (Pontefract) Ltd.
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W. & R. JACOB & CO., (L'POOL) LTD.

. . . one of over 7,000 major industrial organisations with ventilation planned by COLT

Unnecessary fatigue and loss of production were caused by radiant heat and excessively high air temperatures in the Wafer Department at W. & R. Jacob & Co. (L'POOL) Ltd.

Colt were consulted and a detailed ventilation survey proved that although more than sufficient extract ventilation already existed, this was unable to function properly owing to inadequate inlet air supplies.

Five Colt Inflow Units were recommended to supply the inlet air needed whilst at the same time off-setting the discomfort caused by radiant heat by means of the positive air movement created by these ventilators.

This is the most recent of nine separate Colt Ventilation contracts so far completed for this company, all of which have been highly satisfactory.

FREE MANUAL, *with full specifications of the wide range of Colt Ventilators is available on request from Dept. S.38/264.*

COLT *THE SPECIALISTS IN PLANNED NATURAL* **VENTILATION**

COLT VENTILATION LTD · SURBITON · SURREY · TELEPHONE: ELMBRIDGE 6511-5

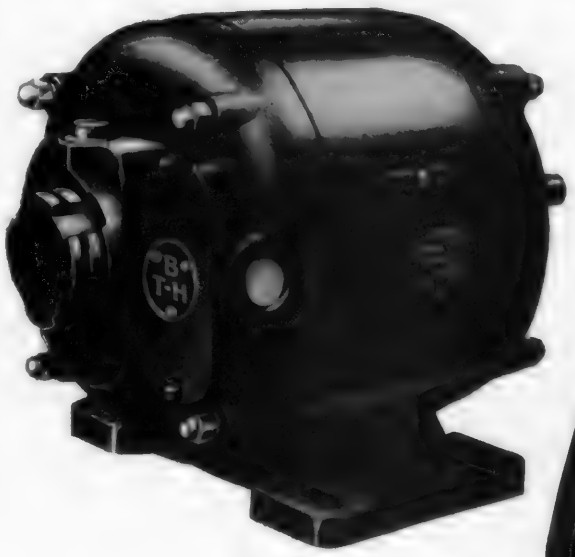
Also at Birmingham, Bradford, Bridgend (Glam.), Bristol, Dublin, Edinburgh, Liverpool, London, Manchester, Newcastle-upon-Tyne, Sheffield and Warwick.

Dependable small-power drives

by

B T-H

FRACTIONAL - HORSEPOWER MOTORS



The endless processes which make up the industrial pattern demand a reliable source of motive power. In the multitude of applications where an electric motor drive of between one thousandth of a horsepower and one horsepower is required, BTH "fractionals" provide economic service with the minimum of maintenance.

Single-phase	*1/8 to 1 h.p. up to 250 volts, 25 to 100 cycles.*
Three-phase	*1/6 to 1 h.p. up to 550 volts, 25 to 100 cycles.*
Direct current	*1/6 to 1 h.p. up to 520 volts.*

Many sizes can be supplied from stock.

For low-speed drives a comprehensive range of geared motor units is available.

All BTH fractional-horsepower motors comply in every respect with British Standard 170.

THE
BRITISH THOMSON-HOUSTON
COMPANY LIMITED, RUGBY, ENGLAND

Member of the AEI group of companies

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Gum Tragacanth

Acacia ✕ Karaya

The experience we have gained as one of the oldest and largest direct importers, enables us to maintain without variation a guaranteed viscosity of our powdered Vegetable gums.

On our modern grinding plant, we produce all grades from kibbled or coarse to the finest powders.

Our laboratory is at your service.

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The
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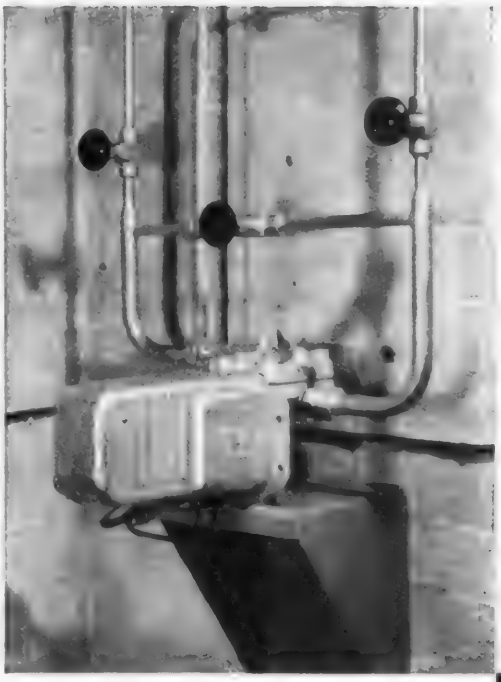

FLOW

measured with the Brown Differential Converter

A Brown Differential Converter measuring steam flow from two water tube boilers at the Newport Works of Monsanto Chemicals Ltd.

The Brown Differential Converter, a mercuryless type of manometer, responds accurately and immediately to rapid changes in flow. Designed for universal flow measurement, this rugged instrument is simple to install, easy to maintain and gives a negligible displacement of fluid in the meter body.

The Brown Differential Converter is accurate to within ± 1% of full scale and sensitive to differential pressure changes of less than 0.1% of full scale. Operating on the pneumatic balance principle, it converts differential pressure at the orifice into a proportional output air pressure. This can be expressed directly in terms of flow or differential pressure. The range of the instrument is manually adjustable from 20 to 200 inches of water and complete protection against overrange is provided. Calibration is simply effected in the field without the use of a water column. Please write for further information . . . freely available from Honeywell-Brown Ltd, 1 Wadsworth Road, Perivale, Greenford, Middlesex. *Sales Offices located in the principal cities of Britain and throughout Europe.*

BRITISH INSTRUMENT INDUSTRIES EXHIBITION
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BROWN INSTRUMENTS
First in Controls

Reduce your Bug Count ★

★ Textile core covered with white smooth flexible plastic

★ Wears smooth not 'woolly'.

★ Can be cleaned in a flash.

★ Highly resistant to oils, fats, greases, acids and alkalis.

★ Odourless and tasteless.

Supplied in any number of plies up to 60".

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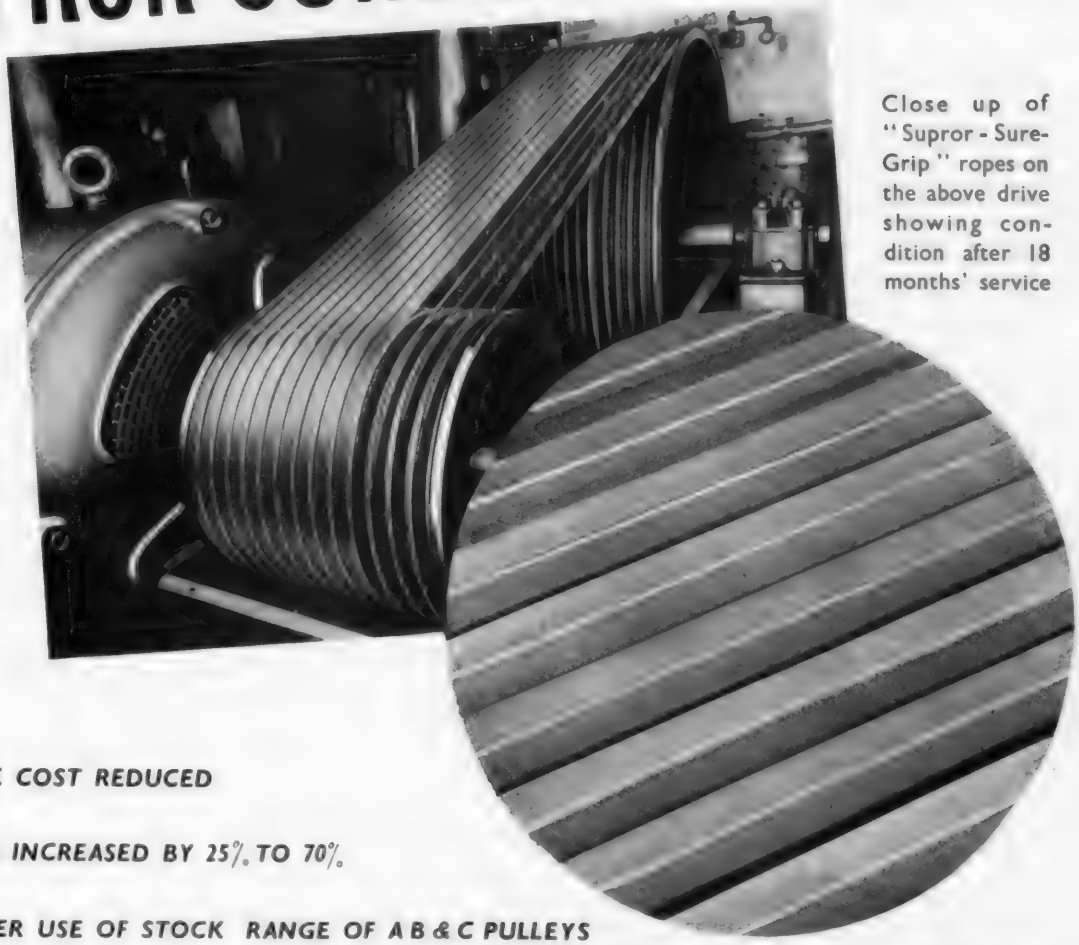
Non-Toxic
FOOD BELTING

Write now for full particulars

RUBBER IMPROVEMENT LIMITED · RILEX WORKS · WELLINGBOROUGH · NORTHANTS

Crofts NEW

SUPROR-SURE-GRIP V-ROPES



220 H.P. Compressor drive indicating saving in number of ropes when replacing original ropes with the new "Supror-Sure-Grip" type

Close up of "Supror - Sure-Grip" ropes on the above drive showing condition after 18 months' service

INITIAL DRIVE COST REDUCED

H.P. RATINGS INCREASED BY 25% TO 70%

PERMIT WIDER USE OF STOCK RANGE OF A B & C PULLEYS

"Supror-Sure-Grip V-Ropes provide the answer to the demand for a stronger, more durable V-Rope. They represent the latest development in V-Rope driving, exacting tests having proved their efficiency and economy in use

PUBLICATION NO 552/14

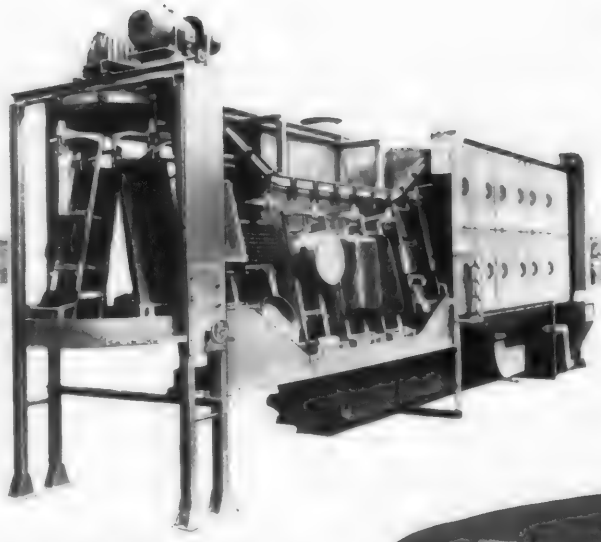
Phone BRADFORD 65251 Extension 73 for immediate attention

Crofts (ENGINEERS) LIMITED. BRADFORD 3. ENGLAND

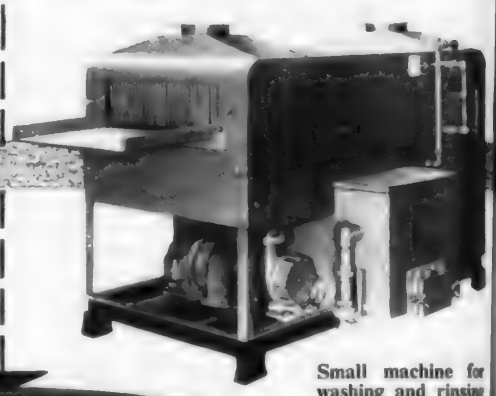
170

PHONE 65251 (15 LINES) GRAMS "CROFTERS BRADFORD"

WASH



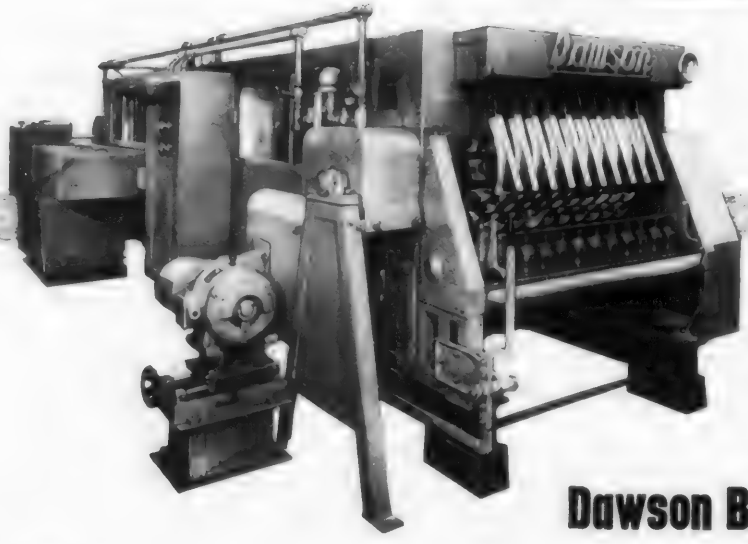
A monorail machine for washing, rinsing and drying varied Food Utensils.



Small machine for washing and rinsing Bakers' Trays.

ESTABLISHED 1864

The Quick, Economical
Dawson
Hygienic way

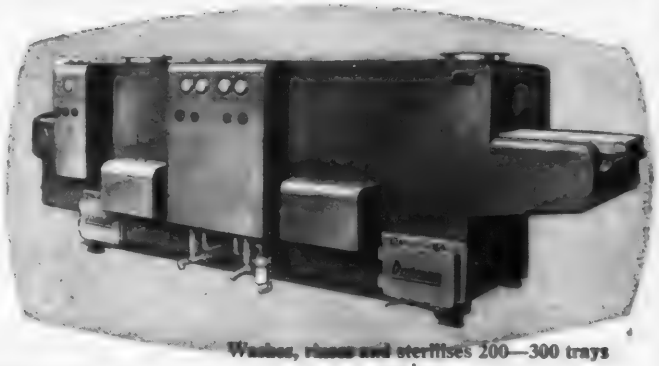


A Bottle and Jam Jar washing, de-labelling, rinsing and sterilising machine.

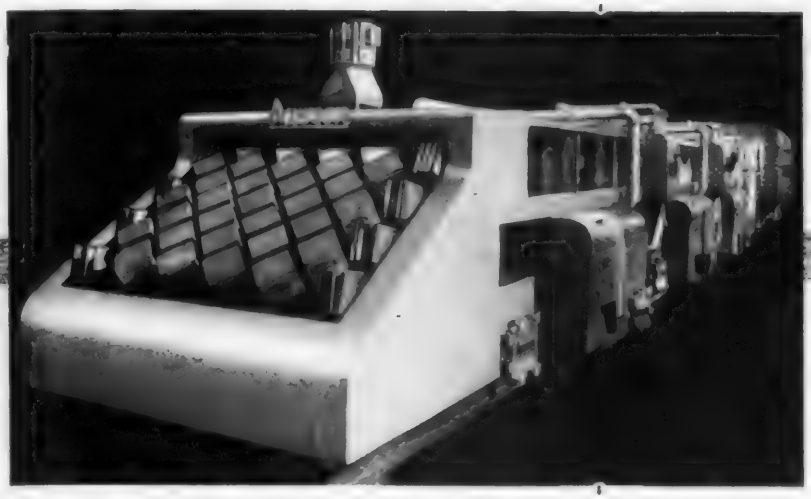
Tel.: Cleckheaton 1080 (5 lines)

Dawson Bros. Ltd., Gomersal, Nr. LEEDS

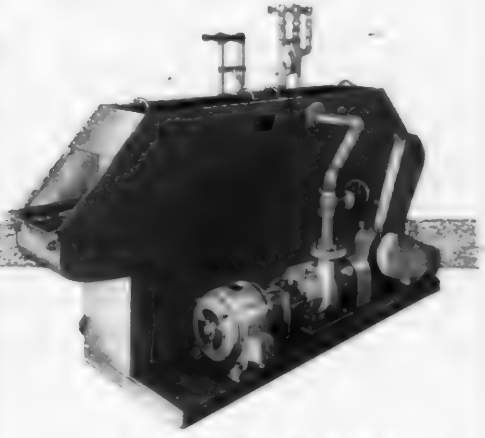
CLEAN



Washes, rinses and sterilises 200—300 trays per hour.



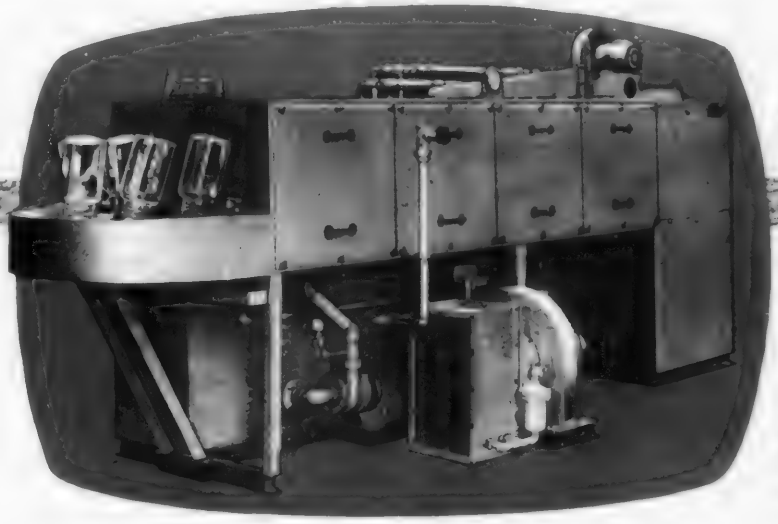
For washing and de-labelling and drying biscuit tins and lids. Capacity 2,000 per hour.



Small Can Washer and Rinser for 30—60 cans per minute.

Make sure that every type of container and utensil used in the manufacture of Food Products is clean, sterile and satisfies Health Regulations.

Dawson washing plant is used extensively today by manufacturers of all types of Food products. Whatever the size or shape of tin, can, tray, jar, bottle, container, mould or food utensil Dawson machines will wash and dry these articles in the minimum time for the lowest cost. Let us know what you have to clean and we shall be pleased to advise you.

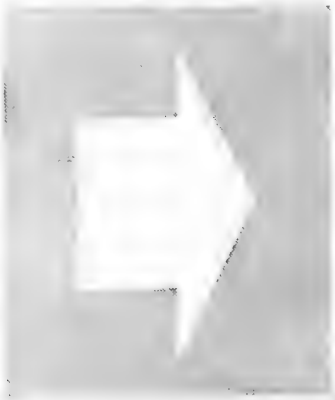


A Rotary Jar and Tin washing and drying machine. Capacity 150 per hour.

London Office:
406 Roding Lane South,
Woodford Green, Essex.
Tel.: Wanstead 7777 (4 lines)

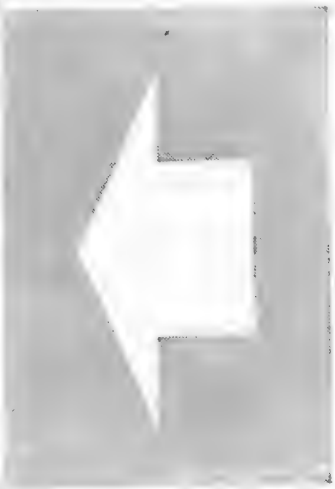
I.C.I. DENDRITIC SALT

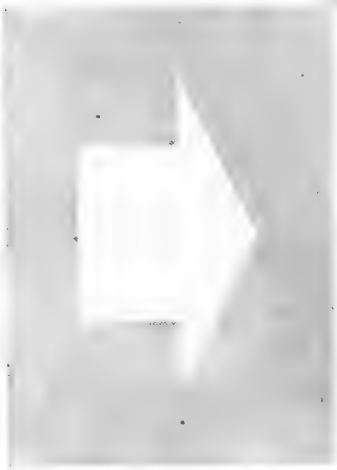
–a NEW fine grade for foodstuffs



I.C.I. Dendritic Salt is a fine vacuum salt with a new crystal shape. It is soft and floury, with the following distinctive qualities—which are of special advantage in many applications in the food and dairy industries :

- Outstanding non-caking properties
- High purity—99.6% sodium chloride
- Blends well with other finely-divided materials
- Low bulk density—ensuring good covering power
- Rapidly soluble in water





I.C.I. Dendritic Salt is of particular interest to users of Dairy or fine Crystal salt, since it not only offers technical advantages but is also cheaper.

Imperial Chemical Industries Ltd. are the sole manufacturers of Dendritic Salt, which is protected by patents in Great Britain and other countries throughout the world.

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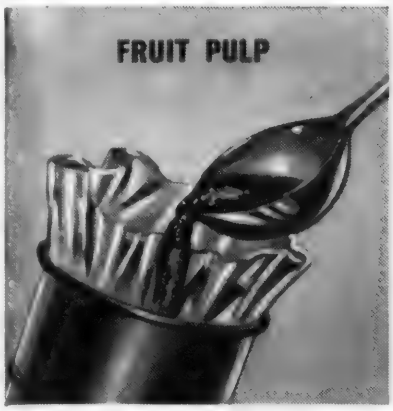

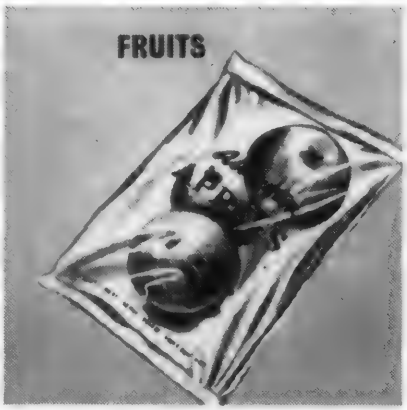

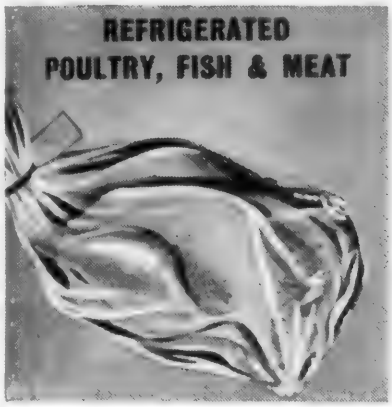

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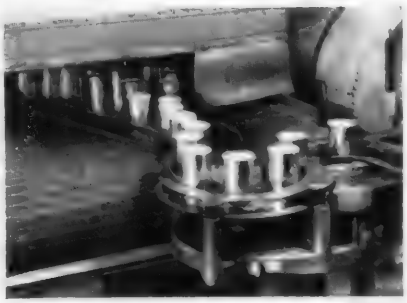
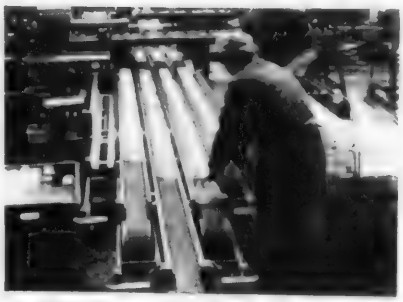
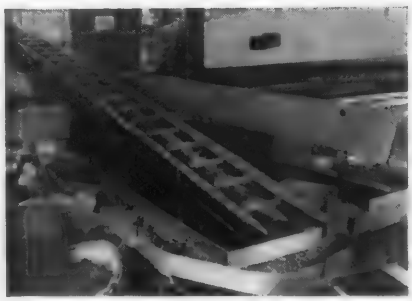


FRESH FRUIT

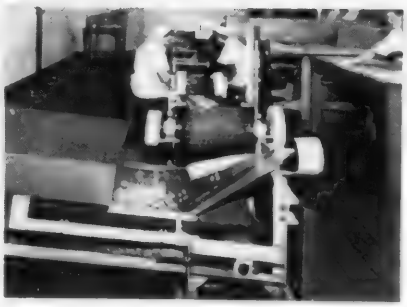
BISCUITS



JAM

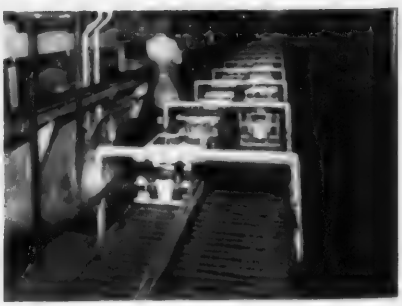


LOOSE PEAS



SWEETS

BEER



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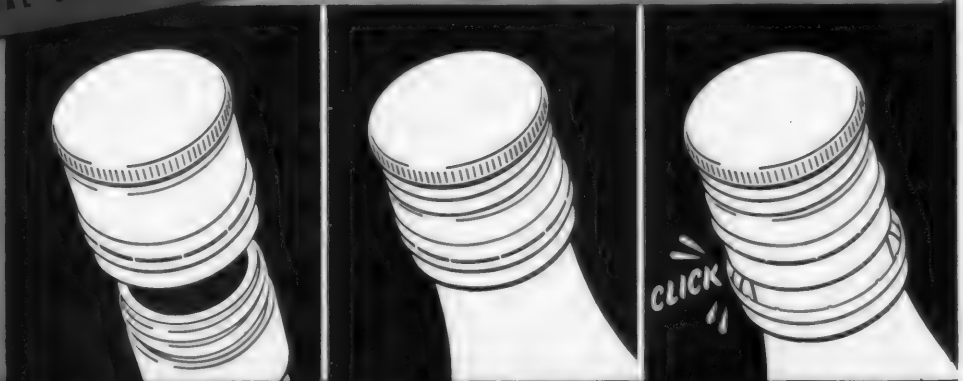

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Above: Upper chamber and heating tubes, showing complete accessibility for cleaning when the hinged cover is swung open.

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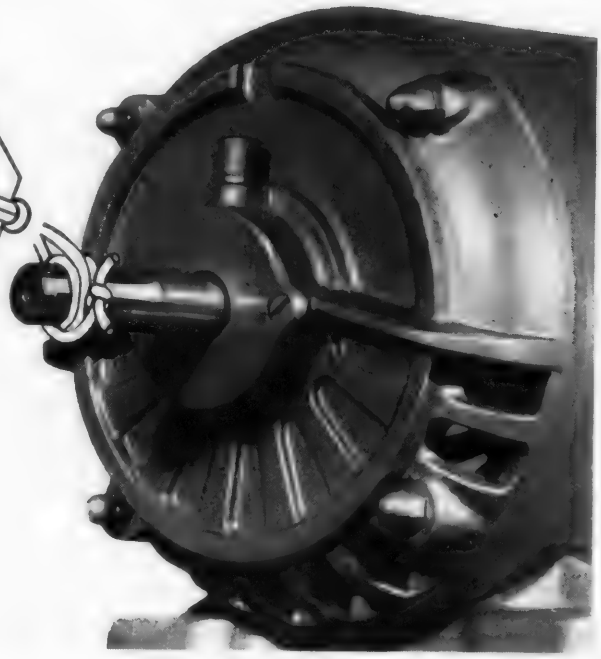

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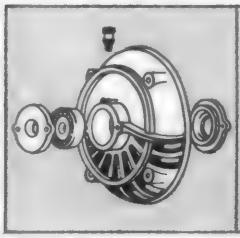
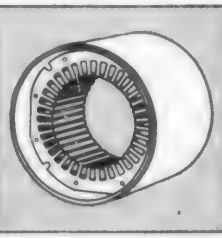
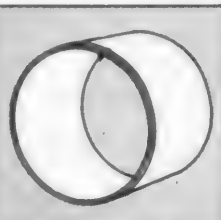
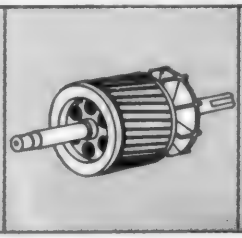
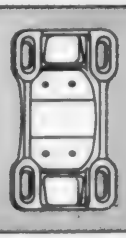
BEARINGS	STAMPINGS	STEEL SHELL	ROTOR	FEET
				
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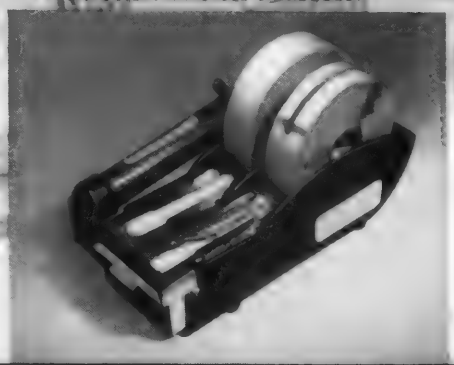

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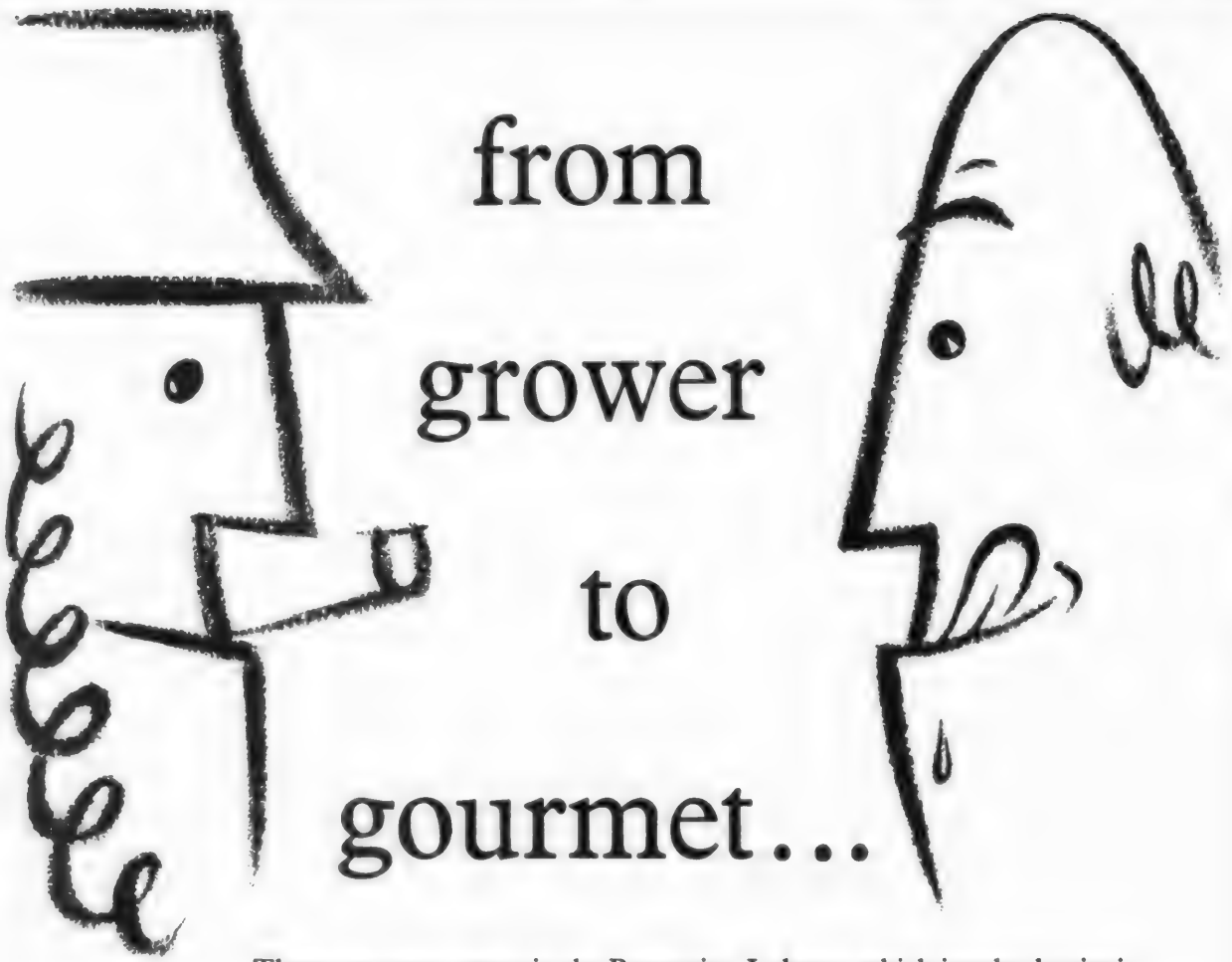

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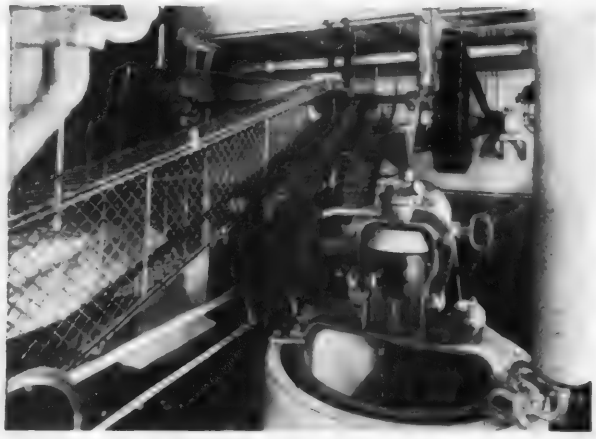

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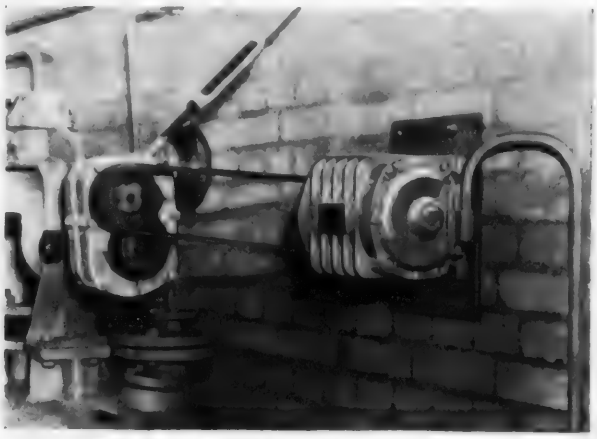
A nationally famous firm of manufacturing chemists had the problem of driving chemical mixers at 60 r.p.m. A base mounted gear box was impractical and a cumbersome and expensive double reduction overhead drive had to be used.



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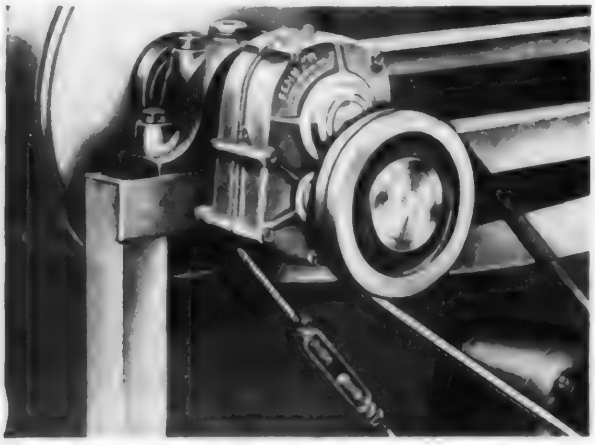

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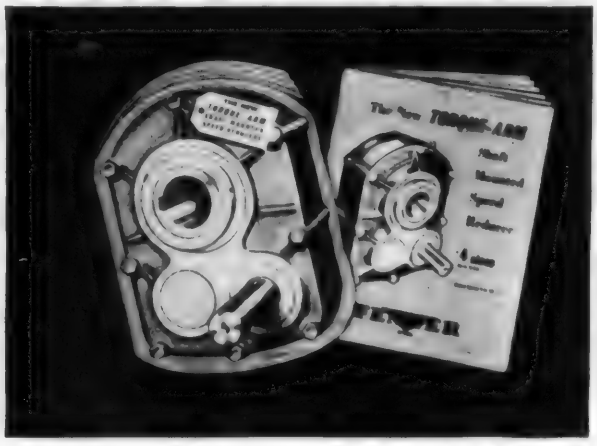

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Literature giving all the facts about Fenner Torque-Arm Speed Reducers is available . . . send for your copy TODAY. Fenner Technical Advisory Service will be glad to consider your Speed Reduction problems and advise on the suitable application of Torque-Arm Speed Reducers.

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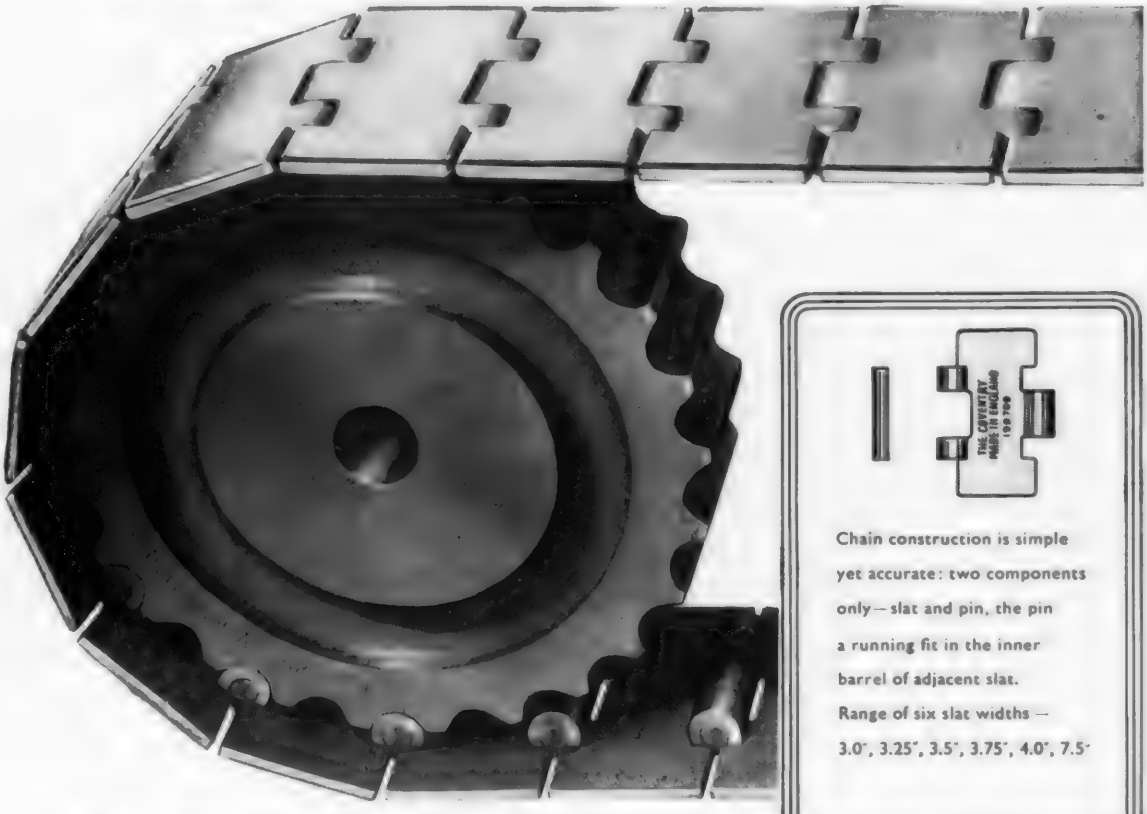

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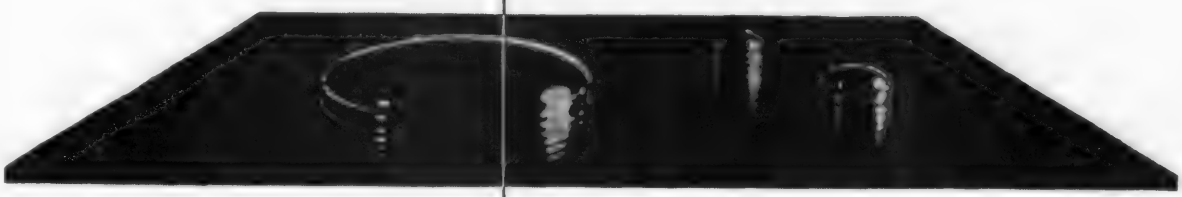

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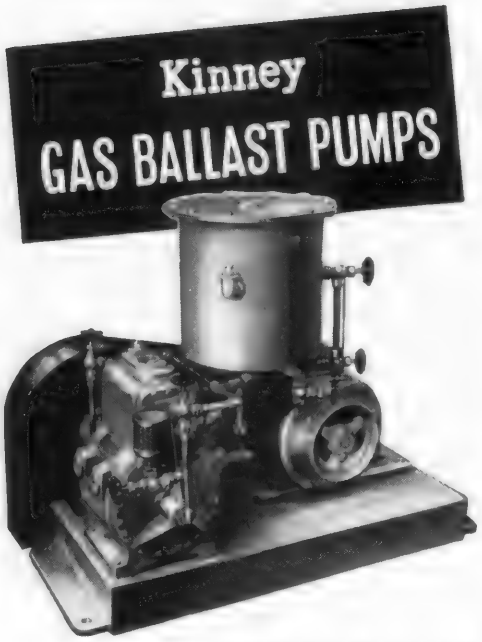

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The KINNEY Gas Ballast Pump has, time and again, demonstrated its decided advantages over other types of Industrial Vacuum Pumps. Not only does it pump condensable vapours without contamination of the sealing oil, but in pumping it uses only one third of the quantity of sealing oil in a normal rotary pump.
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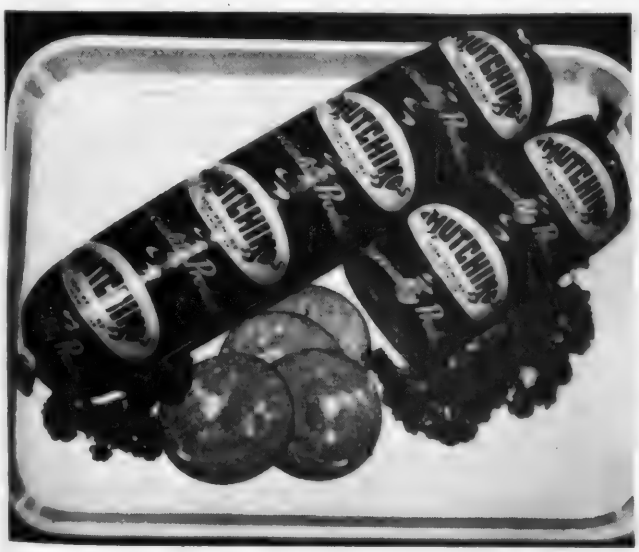

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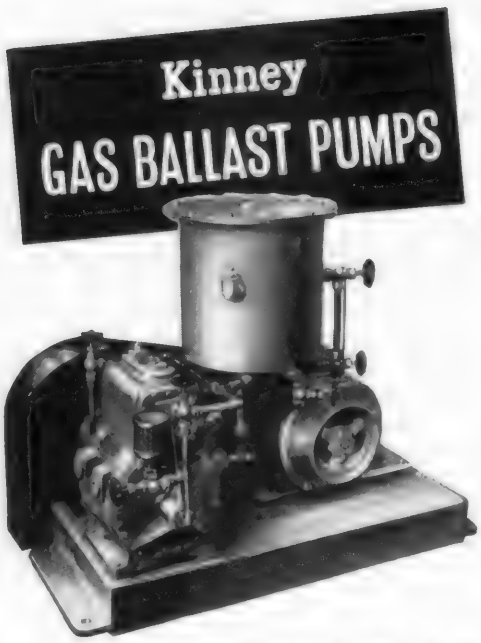

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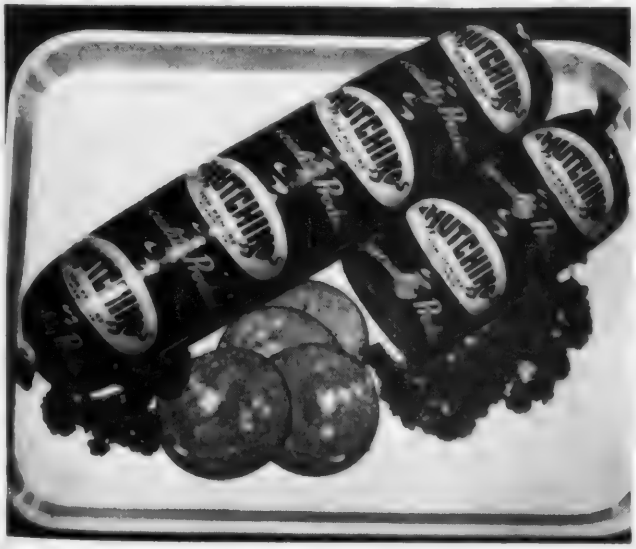

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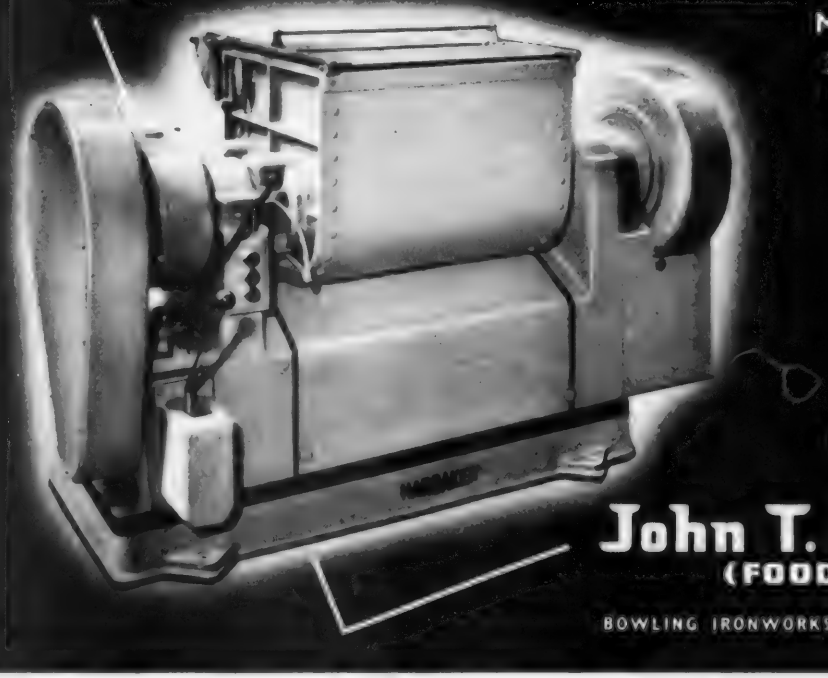

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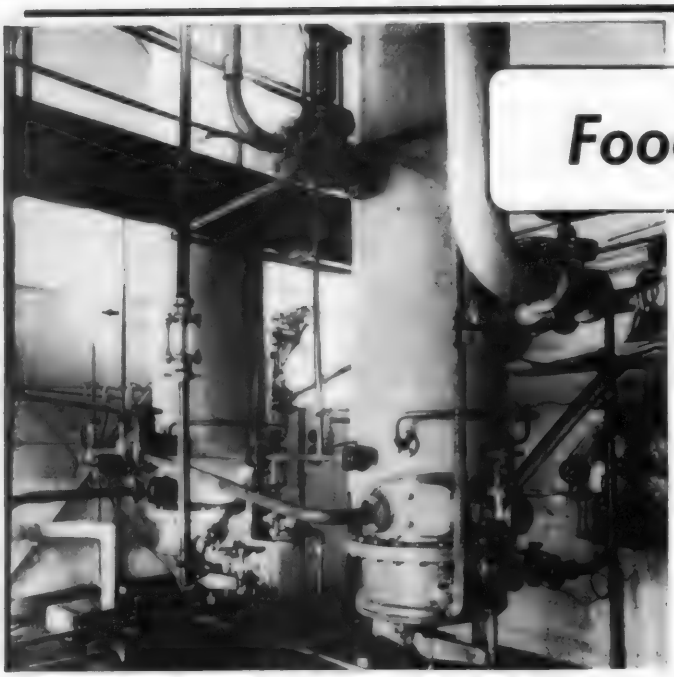

The above illustration is of a Kestner Patent Double Effect Evaporator with vapour recompression for the continuous production of condensed sweetened milk.

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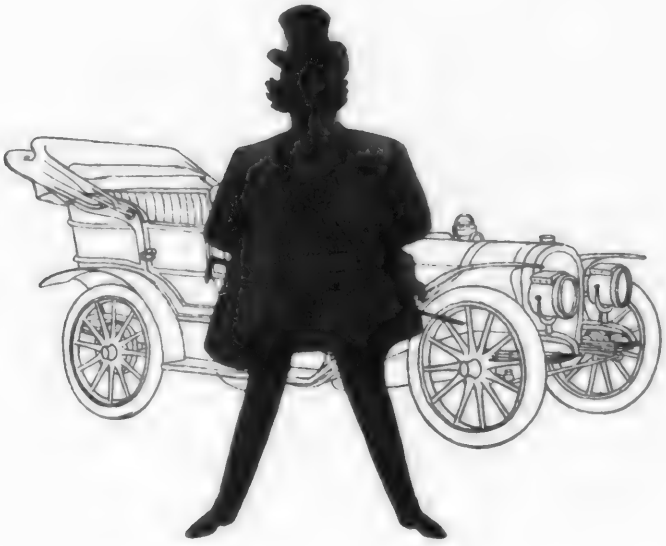
GREAT-GRANDFATHER SPEAKS HIS MIND



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In his day Great-Grandfather set out to make things move. They moved. In today's conditions, his kind of spirit and drive can move mountains.

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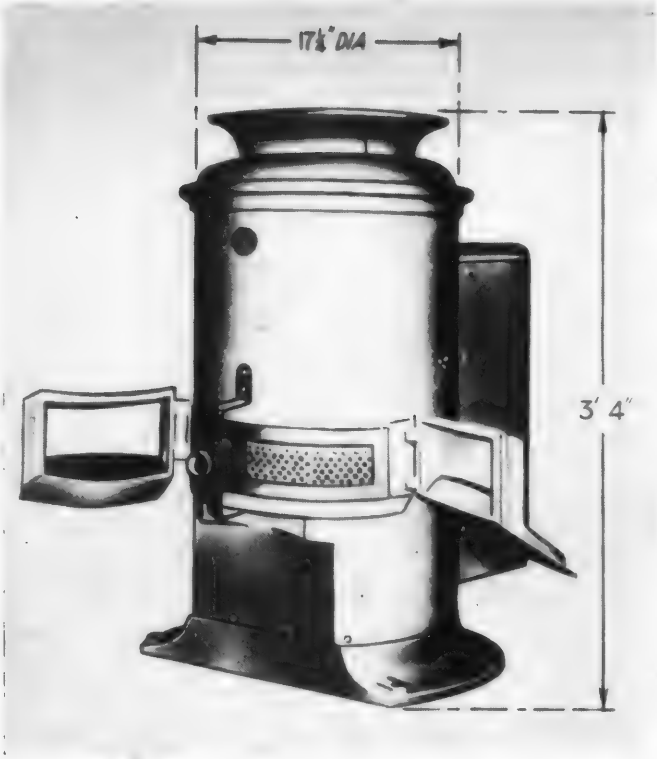

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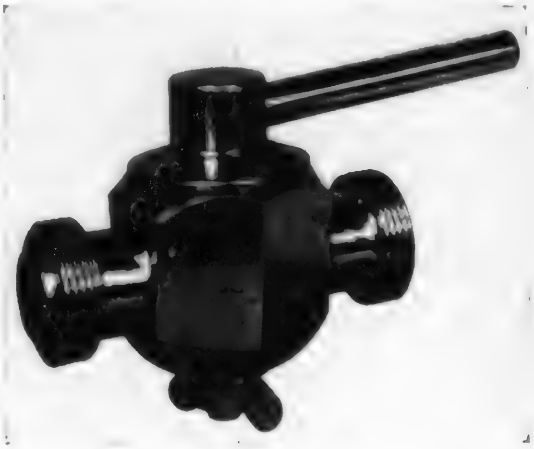

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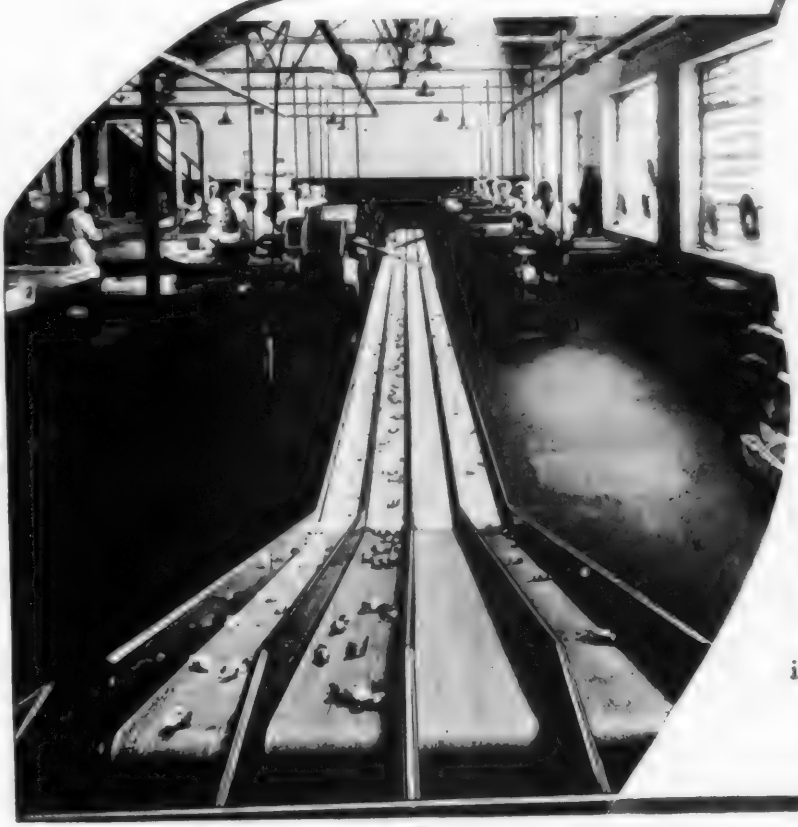

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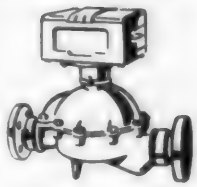

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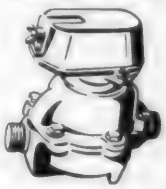

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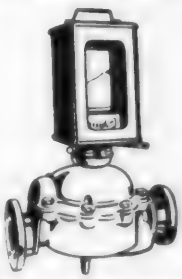

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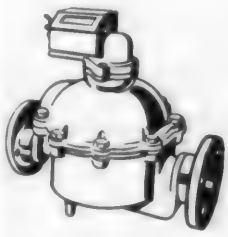

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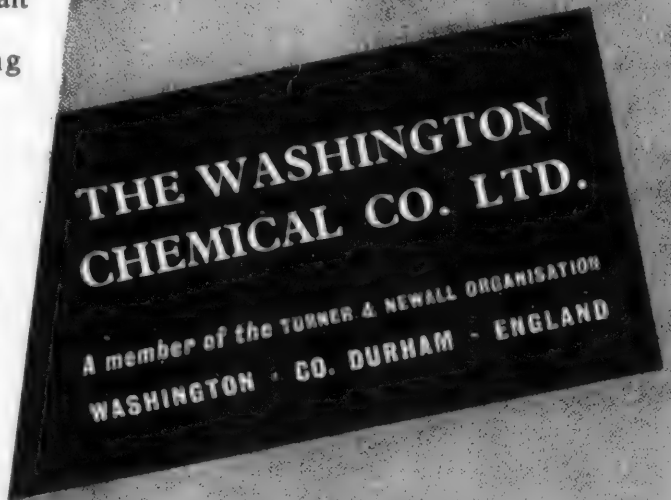
Our Sales Technical Department would be very pleased to advise on the uses of this chemical in any powdered product where free running qualities are desirable.



FOOD MANUFACTURE

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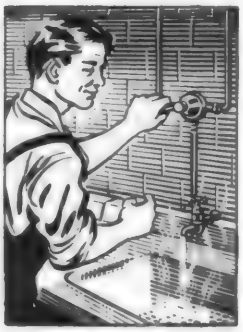

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FOOD MANUFACTURE

Vol. XXX, No. 5 May 1, 1955

Irradiation difficulties

"STERILISATION of foods by radiation seen possible within ten years" is the headline in one of our American contemporaries, while another report suggests that irradiated meat products will be on the market by the summer of 1956. However, in spite of this optimism, acceptability by the public and economical operation are the primary problems shaping the future of radiation-sterilised food. Not the least problem would be the instinctive prejudice of some consumers against radiation—particularly fission-product radiation with all its associations in the public mind of radioactive burns and genetic disorders.

Nearer difficulties are those of flavour, colour and odour changes. Chemical damage to food can seldom be ignored and, undesirable chemical changes during the process do take place. They are in direct proportion to radiation doses and vary from product to product. Bread and some vegetables do not seem to develop off-flavours and odours: milk and meat do. Raw beef for example, develops a strong irradiation odour and flavour. These can be eliminated by de-aeration and deep-freezing before irradiation, but this would be difficult to apply on an industrial scale. A more attractive proposition, commercially, was suggested by Dr. R. S. Hannan at the S.C.I. symposium on ionising radiations last year. This was a procedure of adding protective compounds, including ascorbic acid, which would dispense with the freezing operation. Many processed and cured meats show relatively little flavour change, probably because of the protective effect of nitrite and fat antioxidants which are present.

Of the two suitable sources of radiation—electron generators and radioactive sources giving beta- or gamma-rays—it has so far been possible to work out estimates for the cost of generators. It has been calculated that a typical generator now available, could sterilise samples about an inch thick (irradiating from both sides) at a rate of about 1,000 lb. an hour at an estimated cost of a few pence per lb. of treated product. The British designed linear accelerator seems to offer most promise.

More precise calculations in the United States (published in *Food Engineering*, March 1955, p.100) indicate that pre-cut meats in packages up to 0·7 in. thick can be pasteurised by electron radiation at $1.06 a ton. Complete sterilisation could be achieved for 2 cents a lb. and pasteurising in carton quantities by converting the electron beam to X-rays would increase the cost by about ¼ cent per lb. These calculations are based on dosage data reported in the literature and on research studies in the development of a radiation pilot plant by Applied Radiation Corporation, an American company formed to develop the travelling-wave linear accelerator for large-scale commercial processing.

It is still too early to make a reliable estimate of the costs of fission-product radiation but it seems possible that costs will be comparable to those for electron generators.

Making more of fish and meat

A NEW process for producing low-cost food staples from fish has been developed in the U.S.A. Said to be a simple inexpensive method for separating the fat from the solid portions of wet fat products, thus preserving both, the process is completely self contained and enclosed, producing none of the offensive odours associated with fish processing.

The process was developed by VioBin Corporation of Monticello, Illinois. It produces stable fish meal and flour for both human and animal consumption by dehydrating and defatting fish tissues at low temperatures. The wet organic tissues containing fatty substances are ground and suspended in a fat solvent, such as ethylene dichloride or trichorethylene. Water is removed from the tissue by azeotropic distillation, and the fat is at the same time dissolved and recovered separately. The resultant dried solids are said to retain the same biological values as the original fish. They are fat-free and are said to be stable under storage at room temperature. The process is said to be more economical than present methods of drying and defatting meat and fish. There is no waste or press water, and therefore no water pollution. Thus the quality of the product

is much better, running from 10 to 15% higher in protein than ordinary fish meal. All non-fat and fat parts are recovered, and the product is more digestible. The process can be applied to products other than fish. Waste egg has been processed into oil and meal in a large scale plant, thus making valuable products from a substance hitherto discarded as a total waste. This plant is said to be able to process fish, meat or any other wet fat product into fat and meal. It is claimed that the process has great possibilities in the processing of meat products, being capable of upgrading cheap meats. It is also being adapted for use in processing milk.

The VioBin Corporation estimate that the cost of equipment, accessories and material of a plant processing 20 tons per 24 hr. day of raw material (65% tissue water) would amount to $115,000, not including building and foundations and services to plant site. The plant comprises solvent cookers, desolventisers, solvent work tanks, miscella evaporating system, solvent recovery unit, pumps, motors and drives, and instruments. Daily operating cost, not including overheads, interest on investment, maintenance, repairs, etc., would amount to $183.40. The unit cost per 100 lb. raw material would be $0.459.

The company announces that two plants are to be erected this year, one in Norway and one in Mexico.

Designing products for their packs

DESIGNERS do not sufficiently consider the packaging process, and many troubles in packaging would never have arisen had the product not been designed in quite the way it was. With this contention Mr. F. A. Paine, Chief of the Package Testing Department of the Printing, Packaging and Allied Trades Research Association, advocated the case for designing the product to facilitate packing when he spoke at the recent Packing Exhibition Convention.

To obtain the best results, said Mr. Paine, three things are necessary in regard to the design of all packaged articles. *Firstly*, the packaging of any article should be considered as an integral part of the production cost and not as a separate unrelated item. *Secondly*, the packaging of any article should be considered from the moment the idea of its production is conceived. *Thirdly*, at any stage in the design where there are alternative methods of construction, the influence of these on the packaging must be considered as well as their production aspect Most of the information on this subject has been obtained from tests carried out on packaged articles in the laboratory at PATRA. The types of enquiry received usually fall into one of two main classes: firstly, why trouble and damage have been experienced in practice with a particular article and how to prevent it; and secondly, what would be the most economic and satisfactory method of packing a particular article. The fact that the majority of enquiries are of the first type is, said Mr. Paine, indirect evidence in support of the argument that designers do not consider the packaging process sufficiently at present.

As an example he quoted the case of a soft drinks manufacturer who submitted a pack for twelve 26 oz. bottles which had been found to have a very high breakage rate. They were transported in open tray type containers, which are very efficient and rarely give rise to difficulties since they cannot be mishandled safely. Tests showed that the main cause of breakage could be attributed to the design of the bottles, a very attractive complex shape "all wrong from the packaging angle." The cost of increasing the cushioning between bottles was greater than the losses sustained by breakage and would have been uneconomic. If, Mr. Paine concluded, packaging had been considered during the bottle designing, this would not have arisen.

Food preserved by "trapping" molecules

A METHOD of food preservation in which individual molecules of a substance are trapped in a crystalline framework was described at the 127th national meeting of the American Chemical Society in Cincinnati last month.

The technique was reported by Dr. Hermann Schlenk, Miss J. A. Tillotson and D. M. Sand of the University of Minnesota's Hormel Institute. Dr. Schlenk pointed out that vitamin A is a constant problem for food manufacturers because it spoils rapidly, in spite of existing packaging, refrigeration or chemical methods to achieve stability. The new technique separates the molecules and keeps them from motion "like eggs in a paper carton."

Starch-like materials and a component of bile acid were tested in the search for an "egg carton" because they did not alter the physiological effects of the vitamin when it was later eaten. Also, the characteristic crystalline structure or spatial arrangement of the materials is such that they can both hold vitamin A molecules neatly. Vitamin A molecules were found to be completely stable inside the bile crystals. The delicate molecules were protected from each other so that they did not become disarranged and consequently impotent when eaten later.

It is thought that any unstable compound may be preserved when encased in an inclusion compound of the kind described. More research is needed to discover the best compounds to use for particular food elements.

Minor canned foods

In sixteen years world output of the main types of canned food has doubled while its value has increased seven-fold to the astronomical figure of £1,500 million. These are two of the principal facts emerging from the detailed survey of world production and consumption of canned foods published by the Commonwealth Economic Committee which is reviewed in this issue. As is pointed out in the introduction to the volume, practical considerations have made it necessary to restrict the scope of the summary to main commodities. Thus there are no figures on jams which are canned as a matter of convenience. Nor has any attempt been made to examine the position of quick-frozen foods which are now strong competitors to canned foods. Nevertheless, the survey is one of the most comprehensive and up-to-date now available. Additional interest is provided by a short chapter on minor canned goods—sausages, cream, butter, margarine, tomato juice and soups.

The U.S. is the biggest producer of canned sausages. There output has totalled 30-40,000 tons p.a. in recent years as compared with under 13,000 tons before the war and 107,000 tons in 1943. Of these large quantities, however, the U.S. exports only about 1,000 tons p.a. Italy is the largest exporter, shipping almost 3,000 tons p.a. The U.K. is a good customer for canned sausages, imports being between 2,000 and 2,500 tons until 1953 when they fell to 1,600 tons. South Africa is the main supplier.

Very few official figures of canned cream production are available, partly because output is small and partly because it is often included with canned milk. The Irish Republic, Denmark and the Netherlands appear to be the biggest exporters. In 1953, for instance, Ireland shipped 1,500 tons to the U.K. compared with only 28 tons in 1938. Bulk of the U.K.'s tinned and bottled cream is home produced. In 1939 some 13 million gal. of milk were used to make 7,000 tons of sterilised cream. In 1953 production reached 6,300 tons.

The importance of canned butter, already small compared with other foods, seems to be declining still further. In the Commonwealth Australia is the main producer, her exports in 1952-53 amounting to 3,543 tons. Small quantities of margarine are also canned. U.K. production probably fluctuates between 5 and 10,000 tons p.a., depending on Service needs and exports.

The U.S. is by far the largest canner of tomato juice, accounting for 80 to 90% of world output. Canada makes most of the remainder and Australia comes last. World output has risen steadily since 1938, from 170,300 tons to 565,200 in 1953. The Americans and Canadians drink most of their tomato juice themselves; consumption per head being 7 lb. and 10 lb. p.a. respectively.

As in many other commodities, the U.S. dominates the canned soup industry. Her output in 1953 was 706,700 tons compared with Canada's 91,100 and Britain's 86,200. Australia is the biggest exporter of canned soups and the U.K. the biggest importer.

Mr. Cube insists on fuel efficiency

The Plaistow Wharf Refinery of Tate & Lyle Ltd., has increased its fuel efficiency by 50% over 1937 standards and today refines 8 tons of sugar for every ton of coal burned. Many of the developments which have contributed to this achievement were planned before the war. Some involve accepted principles of steam engineering and others are the result of technical advances in the refining process in which further fuel economy was sometimes the direct objective and at other times a by-product.

The replacement of the boiler plant by two automatically controlled high-pressure units with chain grate stokers reduced fuel consumption by 20% for the same output. The new boilers use up to 80 to 85% of the heat in coal against the 65% in the case of the old boilers. Another and more recent saving was achieved by improving the technique of crystallisation. This increased the yield of white sugar, and reduced evaporation and steam consumption by 10%. One of the first stages in the refining process is to dissolve raw sugar in water to remove some of the impurities by filtration. The water has then to be evaporated at sub-atmospheric pressure, a process which produces a large amount of low temperature vapour. This evaporation was carried out in crystallising pans and the vapour from them was condensed by water pumped from the Thames. The heat absorbed by the water was returned with it back to the river. In order to reclaim some of this waste heat, the vapour was used to heat incoming water to a temperature of 140°F. A later development removes some of the water from the sugar liquor in a separate evaporator at a somewhat higher temperature than would be desirable in the crystallising pans. The vapour from this evaporator is now used for three operations normally carried out with the use of live steam. Fuel consumption was reduced by a further 12%. Another reduction of 5% has since been made by a new technique for dealing with sweet water and the use of vapour from the crystallising pans to heat the factory buildings.

In addition to these fuel economy measures the firm insist on the maintenance of lagging and the prevention of leaks as being vital to the efficiency of the plant as a whole.

A South African grape juice industry?

So far attempts to develop South African grape juices as unfermented beverages have been unsuccessful. One reason is that the varieties grown there are not entirely suitable, the juices having too high a sugar content—often above 20%—and too low an acid content. The Concord variety which produces excellent juice in other countries is not much cultivated in South Africa. Nevertheless, in 1953 about 18,000 tons of fresh grapes received by the Deciduous Fruit Board, approximately 43% of the total, were unsuitable for marketing as fresh grapes, and had there been a successful grape juice industry, most of this fruit could have been processed.

Dr. W. H. K. Coetzee, of the Fruit Research Station at Stellenbosch, has suggested (in *Farming in South Africa*, 1954, **29**, 567) how a grape juice industry could be built up. To reduce the high sweetness of South African grapes, a dilution with water to reach a 17% sugar content would be necessary. This might mean that juices sold would consist of about 80% pure juice only, but Dr. Coetzee counters objections to this by pointing out that fruit drinks based upon squash syrups contain only about 8% of natural juice. Also, with grape juices, tartrates must be removed before bottling to obviate sedimentation, and the added water will reduce this problem by keeping a certain amount of tartrate in solution. The defect of low acidity could be overcome by adding citric acid; this again would assist in keeping tartrates in solution. However, even the blending of different varieties' juices together with these reductions of sugar and additions of acid is not likely to produce a final product as pleasant and refreshing in flavour as Concord grape juice. Dr. Coetzee is ready to make a further divergence from the purist's path and add synthetic methyl anthranilate! It is already known that Concord juice samples consistently contain small amounts of this ester; though it may not wholly account for the superior flavour of this particular juice, it is certainly partly responsible for it. Tasting tests with a 30% grape juice to which the synthetic ester had been added (about 1 oz. per 2,000 gal. of juice) have already given promisingly good results.

With purity already accepted as one of the leading features of fruit juices, the idea of improving unsuitable juices by dilutions and fortifications is not initially attractive. But it has much to support it in South Africa if it can be truly assumed that all the juices naturally produced are unlikely to give a saleable, unfermented pure juice beverage. A more practical objection may arise from cost. The water dilution may help to lower cost, but the additions mean extra processing. Efforts to develop grape juice in South Africa before have failed not only because the product was poor but because it was too expensive. It seems fairly clear that the cost of natural grape juice, before the "improving" operations, will need to be low if the new industry is to have much chance of establishment.

Practical genius

The centenary of the death of Bryan Donkin which falls this year is of as much interest to the food industry as it is to papermaking. Donkin was the man who was called in by the Fourdrinier Brothers to improve Roberts' papermaking machine and subsequently built almost all the fourdriniers in the country. The food industry can also claim him as a pioneer because British canning became a practical reality after Appert's discovery only when Donkin, Hall and Gamble made an unrivalled name for themselves in this field. A Northumberland man, Bryan Donkin began experimenting and constructing as a child. Encouraged by his father, he was even more fortunate when his father's friend Smeaton of Eddystone fame recommended him to become apprentice to Hall of the Dartford ironworks.

Since the early containers were of sheet iron, it is understandable that Hall was keenly interested in the new outlet for iron. Yet it is doubtful whether Donkin and Hall paid Appert £1,000 for rights in the canning of food, a statement given in Bremner's "Industries of Scotland" and in a history of the Hall concern. Appert had no patent rights, and there is no such transaction recorded in the history of the House of Appert.

By 1812 Donkin had established a factory at Blue Anchor Road, Bermondsey, from which was sent forth an ever-increasing output of tinned foods, particularly from 1818 when a contract for naval stores gave Donkin and Hall almost a monopoly.

The history of Arctic and other explorations could hardly have been written without including Donkin and Hall's preserved meat. Two tins of their veal and carrots were found to be wholesome after more than a hundred years, admittedly dumped on Arctic ice. In striking contrast over 100,000 lb. of the products of other canners were condemned at one victualling yard alone. Later a canning factory was established at the naval yard at Deptford but the products were so dubious in quality that the naval ratings coined a gruesome term for the meat. A woman named Fanny Adams had been murdered in a Hampshire field and her body hacked to pieces. So the canned beef at Deptford became "Sweet Fanny Adams!"

Inspection of filled bottles under strip lighting.

Mechanised Manufacture of Soft Drinks

"CORONA" OPERATIONS AT SWANSEA

A bold programme of mechanisation costing over £300,000 a year, has enabled Thomas and Evans to reduce labour requirements and to keep down the prices of their "Corona" soft drinks and fruit squashes. Continuing expansion has been the reward of the policy and today this Welsh company claims to be not only the largest supplier in Europe of soft drinks direct to the consumer, but the largest single supplier by volume as well. To illustrate "Corona" production methods we describe their Swansea factory, one of a chain of 52 located strategically throughout England and Wales.

THERE has been a striking increase in soft drink consumption since the war. In 1945 production was 150 million gal. (the actual quantity coming from the factories was less than this, but the figure is arrived at after calculating the amount of drinkable liquid obtained after dilution of the concentrated squashes which account for more than half the total). By 1953 this had risen to 227·18 million gal., which is over 4 gal. per head of population. This is over 100 million gal. more than before the war, when output was between 120 and 130 million gal. The number of manufacturers has steadily risen and now totals close on 1,000. The majority are local businesses, less than 20 being large enterprises.

While it would be wrong to conclude from these figures that we are losing our taste for beer, it is true that in 1953 beer output was not appreciably greater than in 1939. The figures are 899 million gal. compared with 888·29 million gal.

Several reasons, including the greater preference for home life created by television, are adduced for the increase in soft drink consumption. To this growing popularity the firm of Thomas and Evans Limited, makers of *Corona* Family Drinks, have made a major contribution.

Corona drinks are manufactured in 52 factories situated strategically throughout the greater part of England and Wales. These factories are in their turn supported by a number of depots. The drinks are distributed in two ways: chiefly door-to-door by a team of salesmen operating with both petrol and electric vehicles; and also through normal retail channels. Within the past few months the firm have extended their coverage of the country by purchasing the whole of the issued capital of Brooke and Prudencio Ltd., makers of *Neptune* drinks with 11 factories in Bristol, London and along the south coast.

Thomas and Evans now have a capital of close on £1 million. They employ 3,000 people and run 1,250 vehicles whose average load is 70 doz. bottles of assorted *Corona* drinks which include squashes as well as carbonated beverages.

Although soft drink manufacture is the greater part of their business, the company also have a vinegar brewery at Worcester and a tea blending department. In addition, they own 100 grocery shops, all located in Glamorgan. The company's trading profits have risen steadily, from £116,000 in 1936, the year after they became a public company, to £627,000 in 1954.

Undoubtedly, one of the chief reasons for their success is that they have been able to keep their drinks inexpensive. Before the war, a case of four 26 oz. bottles cost 1s. Today the price is 2s. To keep down costs the company have consistently invested large sums in modernising their factories with the most up-to-date production plant and mechanical handling equipment.

William Evans

This large and prosperous company with its nation-wide influence is the creation of William Evans, a philanthropic and public-spirited Welshman who died in 1934 at the age of 69. As the eldest son of a poor family, William Evans received only the scantiest education and, when he was 14, left home to enter the grocery trade as an apprentice to Mr. James Rees of Haverfordwest, being considered too delicate to make a farmer. After three years of what he called "bondage," he was handed his indentures and went to Aberbeeg to work as a junior to Mr. William Thomas. He was very happy in Mr. Thomas's home, and after $2\frac{1}{2}$ years, when he was still only 20, he started with him the business of Thomas and Evans in the Rhondda town of Porth. However, Thomas's own business and his public activities claimed more and more of his attention, and after three years the partnership was dissolved although the original name, which was to become known far beyond the Rhondda, was retained. The original location of the business was also retained and the headquarters of the firm are still at Porth.

The man from Texas

After carrying on the grocery business for ten years, William Evans had what he called an unusual experience which is best described in his own words. "One morning a somewhat seedy quack doctor type of man walked in to introduce some speciality which was guaranteed to do everything and cure all. I took but little interest in him for a while despite his eloquence, until he blurted out that people in this country could not appreciate brains and sought to prove his assertion by saying that he (a brainy man) had not had any breakfast, nor had his wife, who was outside. He told me, among many other things, that he had been a partner in a drug business in Galveston, Texas, and that his partner had walked in one morning, pointed a pistol at him, and ordered him to leave the premises instantly, which he thought it best to do, since a refusal meant certain death. I knew they did some strange things in Texas, but I did not quite swallow that story. The man, however, fascinated me with his cool assurance and confidence in his ability to 'make good' if given the opportunity. Among many other wonderful things he said he could do was to brew non-alcoholic drinks, the like of which England had never seen. He induced me to place a building at his disposal and equip it with a few simple appliances by the aid of which he was going to prove all his claims. The only thing he did prove was that he himself was a 'dreamer of dreams,' and after a few months of experiments and failures we parted company."

Bizarre and unsuccessful as was this episode, it had the important result of arousing William Evans to the possibilities of soft drinks. At that time "anything wet" was considered good enough for teetotallers so there was plenty of room for innovation and enterprise. After studying the subject thoroughly, Evans began making non-alcoholic beverages under the trade name "Welsh Hills," a trade mark which was later changed to *Corona*. By 1914 he had a dozen factories producing these beverages, but further expansion was checked by the war.

Where it all began. The little grocery shop at Porth where William Evans laid the foundations of a million-pound company.

The man who started it all. William Evans, J.P., C.C., founder and governing director, 1885-1934.

All machinery at Swansea has been installed in a large "well," a tiled rectangular depression about 7 in. deep. The staff work all round the well and thus keep their feet dry. Bottles are uncrated and examined before passing to the washing machine (right) after which they pass to the filling machine and bottle rocker (left). The carbonator is the cylinder just in front of the filling machine; to its right is the water cooler. The domed tank (top left) is the bulk carbon dioxide storage tank.

The Corona empire spreads

After the war the present distribution system of door-to-door salesmen was started. In those days horse-drawn vehicles were used. The idea of having soft drinks delivered into the home in the same way as milk or bread proved popular and the company flourished in their home soil of South Wales.

The general depression of the middle twenties cut the buying power of the local population which had hitherto supported the *Corona* men, and the company looked over the border to England. At the time, the chief competitors were the suppliers of soft drinks in gallon jars. Evans' answer to this was to sell a crate of four differently flavoured drinks for 1s. The appeal was to the family with the attraction of different flavours to suit different tastes. The four bottle sales unit is still the basis of *Corona* salesmanship. The excellent value represented by four 26 oz. bottles for 1s., coupled with the convenience of having the drinks delivered and the empty bottles collected, resulted in steady growth, and by 1934 the *Corona* empire extended to London.

This was the year in which William Evans died, a man much loved and greatly honoured, whose work extended to the many public duties involved in being a J.P. and a County Councillor. That he was able to spend so much time on public affairs was due to the devotion and help of his brother Frank. On William's death Frank Evans became chairman and managing director of the Company. In his duties he was supported faithfully by the directors and managers who had served his brother so well. They included the present chairman, Mr. W. D. James, the late Mr. J. L. Thomas, who was chairman from 1940 to 1951, Mr. Idwal Rees, Mr. E. Hibbert, and the late Mr. J. Simmonds, together with very many branch managers who had spent most of their working lives with the company. Further changes came in 1935 when Thomas and Evans were floated as a public limited company. In 1940 Frank Evans died and he was succeeded as chairman by J. L. Thomas, who retired in 1951. He was followed by W. D. James, who is still chairman but who relinquished his managing directorship

in September last. There are now three joint managing directors: Messrs. J. Glyn Williams and Frank Webster, who are in charge of soft drinks, and Idwal Rees, who supervises the grocery interests.

The Swansea factory

To study the *Corona* production methods we visited the Swansea factory, one of the newest, which commenced operations in 1952. It is a single floor building except for one end which is divided into two floors to provide office space and a room for syrup mixing, the idea being to feed the syrup by gravity direct to the filling machine. The building provides 12,000 sq. ft. of factory space and 2,000 sq. ft. of office space.

The Swansea factory is of medium size by *Corona* standards. The approximate investment is: Factory, £30,000: Plant, £15,500: Motor vehicles and fork lift truck, £8,000; Bottles and cases, £7-8,000. There are about 50 people on the payroll, including the salesmen. Eleven vehicles are used to cover Swansea and outlying districts, where deliveries are made six days a week. Besides the manager and works manager, the production staff consists of 14 girls who operate a plant capable of turning out 400 dozen 26 oz. bottles of carbonated drinks per hr.

In bygone days the mineral water factory was not one of the pleasantest places to work in owing to the large quantities of water lying about. At Swansea this has been overcome by installing all machinery in a large "well," a tiled rectangular depression about 7 in. deep. The staff work all around the well and thus keep their feet dry. The equipment in the well consists of a bottle washing machine, a filler, bottle rocker, sighting equipment, labeller, filters, carbonation plant and water cooler.

The production routine begins with bottle washing. Crates of empty bottles are transferred from the vehicles in the unloading bay to the washing machine on pallets by electric fork truck. After being uncrated, each bottle is carefully examined for foreign matter and if passed is placed in the washing machine. The bottles, complete with their swing stoppers, are inserted bottoms up and before actually entering the machine travel up an inclined ramp to ensure complete drainage of contents. They are given a pre-rinse with tepid water followed by a thorough scouring inside and out with a detergent solution at 145°F. Every bottle passes over 18 jets and is then given a warm rinse and, finally, a cold rinse with water direct from the mains. During the washing the old labels are removed. The detergent strength is maintained automatically by an electronic instrument which operates from a sensitive electrode in the solution tank of the washing machine.

W. D. James, present chairman of Thomas and Evans Ltd.

The cleansed bottles are ejected from the washer on to a conveyor and each is carefully inspected against a white illuminated sighting screen to ensure that no foreign matter remains inside or out. Cracked and chipped bottles are, of course, rejected. The fact that both bottles and stoppers are simultaneously sterilised and inspected is a point in favour of swing stoppers.

The whole object of the process is to ensure that the least possible time elapses between the cleansing and inspection of bottles and filling. Consequently, immediately after inspection the bottles enter the rotary filling machine. This works on a figure-of-eight principle. First each bottle is dosed with 4 oz. of syrup, made in different strengths according to the flavour. The bottles then pass to the second part of the machine to be filled with filtered and carbonated water. The filling rate is adjusted to prevent fobbing and, indeed, the filler is so efficient that the carbonated water and syrup do not mix in the bottle. Thereafter mixing is effected by an ingenious machine which seizes each bottle and shakes it. The swing stoppers are snapped into position after each rubber seal has been inspected individually. A final inspection of the contents occurs before the conveyor belt and the automatic labelling machine. The filled and labelled bottles are then crated a dozen at a time and the crates stacked on pallets for mechanical handling by the fork lift truck.

Syrup manufacture

As already mentioned, the differently flavoured syrups are made up in a room separate from the main factory area. All syrup recipes are standardised throughout the company. Orange and lemon are the most popular. Others made include ginger beer, cream soda, "Cydapple," "Clarade" (raspberry type), "Limeade," and Dandelion and Burdock, the latter being a favourite in Wales. The fruit essences are supplied by four well-known manufacturers. The ginger flavour is brewed ginger root and the Cydapple is concentrated cider which comes in large barrels. All flavours except the two latter contain citric acid and the usual soft

Handling crates by electric fork-lift truck. Mechanisation is the keynote of "Corona" production methods and mechanical handling equipment has been installed in all factories on a large scale. The mechanisation programme is costing the company some £300,000 a year.

The washing machine. All bottles are inspected before being placed in the machine where they are given a pre-rinse with tepid water followed by a thorough scouring inside and out with a detergent solution at 145° F. Finally they are given warm and cold rinses.

drinks preservatives are used, namely potassium metabisulphite and benzoic acid. The former is used only in squashes.

Syrup is made by mixing cold filtered water with sugar to a gravity of 45·5° Twaddell. From the syruper it is pumped through a cloth filter to stainless steel mixing pans where the essence and other ingredients are added. It is fed to the filling machine by gravity through glass pipelines. Fruit juices, syrup and other ingredients are blended to produce the company's range of fruit squashes, which contain no sweetening matter other than sugar.

Carbonation

Perhaps the most interesting operation from a technical viewpoint is the production of carbonated water. For this the Swansea factory is equipped with the latest plant.

Carbon dioxide is delivered in bulk instead of in cylinders or in solid form, a system introduced immediately after the war by the Carbon Dioxide Co. Liquefied gas transported in road tankers is discharged into a 1½ ton capacity low pressure static tank. This is insulated and equipped with a ½ h.p. *Freon* fully automatic refrigerating unit to maintain the required temperature of about −5°F. and the tank pressure at 270 p.s.i. The fusion welded, mild steel tank is 8 ft. in diameter and 10 ft. high. Safety devices include one pop-off valve with bursting disc to operate at 350 p.s.i. and one relief valve with bursting disc to operate at 500 p.s.i. The tank is mounted on a spring-loaded platform which is connected with a column of mercury calibrated so that the contents of the tank can be read directly.

Bulk delivery and storage of CO_2 eliminates much tedious handling and, it is claimed, ensures constant carbonation pressure with no losses of gas. Carbonation continues uninterrupted while the storage tank is being refilled. Five to six ton storage tanks are available for large consumers of CO_2 and are used at other *Corona* works.

Temperature is a critical factor in carbonating water, and to ensure optimum absorption of the gas the water is chilled to 37°F. The water is first pumped through disc filters of 1,000 gal./hr. capacity, after which it is chilled in a *Freon* cooler by passing over stainless steel coils. The chilled and filtered water is then passed at a steady rate to a stainless steel counter-current CO_2 absorption tower where it flows down a column packed with glass marbles. From the carbonator the water flows at a steady rate to the filling machine into which all operations are dovetailed. People in some areas like their drinks sharper than in others, and the degree of carbonation is accordingly varied slightly to suit local preferences. At Swansea the drinks contain 3·8 volumes of CO_2 and samples from each batch are checked with a pressure gauge and thermometer to ensure that this standard is maintained. The check is simplified by using a standard apparatus and a chart whereon CO_2 volume is expressed as a function of temperature and pressure.

The quality control of products is the immediate responsibility of the factory manager, but he is supervised by an area manager responsible for a number of factories each of which he visits every 10 to 14 days. In addition, the company employ area auditors who visit each factory every three or four months. Quality control of all raw materials is centred in the headquarters at Porth, where the central engineering department is also located.

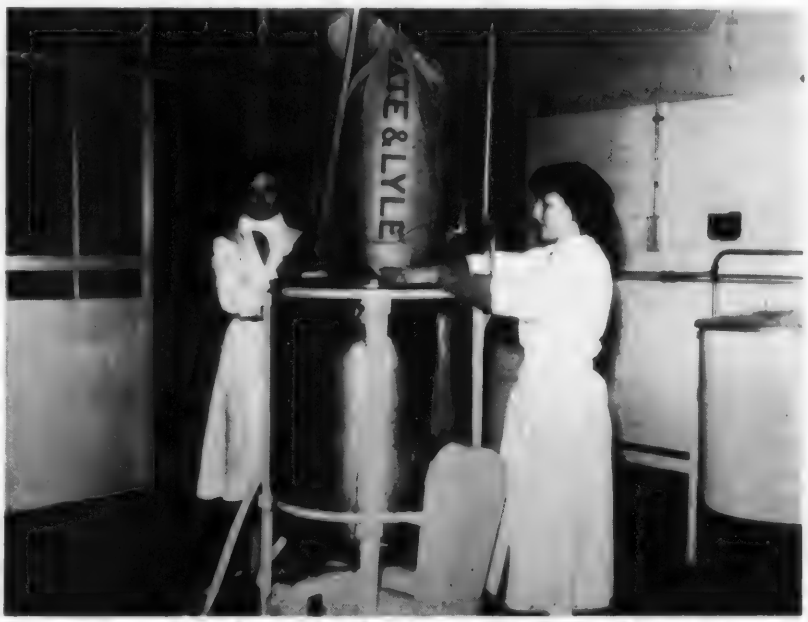
Innovations

The Swansea factory is a good example of an up-to-date *Corona* factory. The equipment, from the CO_2 tank to the automatic labeller, is the most modern available. However, Mr. Glyn Williams, joint managing director of Thomas and Evans, told us he would like to introduce still more mechanical handling into all the firm's factories. He would, for instance, like a mechanical system for loading the bottles into the washer, but so far this has not proved feasible owing to the retention of the swing stoppers for the very good reasons already mentioned. Another improvement Mr. Williams would like is fired-on labels for the bottles. But the variety of products made precludes their adoption. The pre-mix method of making soft drinks is not applicable to the *Corona* factories for the same reason. With this method, which is popular abroad, the syrup and water are mixed in bulk and then carbonated so that the entire contents of each bottle are fully carbonated in contrast to the present system where approximately one-sixth of the contents, consisting of syrup, remains uncarbonated. While the pre-mix system works well in a plant making only one product, it has disadvantages when several different flavours are produced because it would mean repeated and possibly unsatisfactory cleaning out of the carbonator.

Electronic sighting is another example of an automatic control which normally can be used only

(*Concluded on page* 189)

The factory on the Fforestfach trading estate, Swansea. It was built in 1947.



The syrup room. Syrup is made by mixing sugar with cold filtered water to a gravity of 45·5° Twaddell.

The bottle rocker through which all filled bottles pass to ensure complete mixing between the carbonated water and the syrup.

Palatability of Chilled and Frozen Beef

By N. H. Law

(Dominion Laboratory, D.S.I.R., Wellington, New Zealand)

The palatability of chilled, frozen, and faster frozen beef has been compared. Taste panels were unable to detect any significant difference in the effect of treatments upon meat flavour, juiciness, and tenderness. It appears that if meat is initially of the highest quality, frozen beef is as palatable as chilled beef.

THE opinion is widely held in the meat trade that freezing has a deleterious effect on the palatability of meat, and is used with a disregard for the effects of age, breed and sex, as an argument for resumption of the chilled-beef trade.

Moran and Smith[1] demonstrated that when loin joints from 2- to 3-year-old prime Aberdeen Angus bullocks were submitted to freezing and to chilling, and compared for palatability, no significant difference could be detected between the treatments. They remarked that their conclusion was in marked contrast to popular opinion, and perhaps should be accepted with some reservations considering that the original meat was of the finest quality, and certainly superior to the average hard-frozen beef imported at that time. Only joints were frozen, and not quarters, and thawing of the frozen joints was carried out slowly to reduce any damage that might have been done by freezing. Further, the meat was stored in the frozen state for only a few days, whereas in the trade the customary period of storage might be at least 2 to 3 months. These investigations were not extended to coarser cuts.

With the resumption of the chilled-beef trade between New Zealand and the United Kingdom in 1952, interest in the difference in palatability between chilled and frozen beef of the same initial quality was revived. Experiencing difficulty in extending freezing capacity the meat industry investigated the practicability of freezing beef more quickly in eighths, whereby beef could be frozen from a temperature at the bone of 56°F. to 2°F. within 38 hr. It was considered that this faster freezing might improve the quality of beef by preventing the formation of large ice crystals within the muscle tissue, with a consequent reduction of "drip" in thawing.

The first post-war shipment of chilled beef from New Zealand in 1952 provided an opportunity to assess the difference in palatability of beef subjected to three methods of preservation, namely, chilling, freezing and faster freezing.

In 1953 the experiment was repeated, the design being essentially the same, except than no comparison between frozen and faster-frozen joints was made.

Design of experiment

The aim was to compare beef from animals at a high plane of nutrition, alike in breed, age, sex and weight, prepared under identical conditions, and subjected to three treatments, chilling, normal freezing, and faster freezing. The beef was then transported under normal conditions, except that special precautions were taken to avoid fluctuations in temperature during ocean transport. The chilled quarters were carried in 10% carbon dioxide gas at $29\frac{1}{2} \pm \frac{1}{2}$°F., faster frozen eighths at 13 ± 1°F., and normally frozen quarters at about 14°F.

It was considered that a sufficiently good comparison could be made by employing three carcases only, which was the maximum number that could be submitted to organoleptic testing by the trained panels available without fatigue, within the 7 days' limit imposed by the perishable nature of the chilled meat after removal from the ship's locker.

In the 1952 experiment, from a group of 45 Polled Angus, three beasts were selected at the same high plane of nutrition, alike in age and sex, and falling within a narrow weight range (dressed weights of sides 340 to 360 lb.). The left side of carcase 1 was chilled, the right side frozen; the left side of carcase 2 was frozen, the right side faster frozen in eighths; the left side of carcase 3 was faster frozen in eighths, the right side chilled. Sides selected for faster freezing were cut longitudinally after setting and across between the 10th and 11th ribs, wrapped in stockinette, and faster frozen.

The 1952 experimental consignment was sent with a trial shipment of 760 quarters of chilled beef, 48 eighths of faster frozen beef, and 24 quarters of normally frozen beef. On arrival in the United Kingdom the meat was cooked and tasted by panels operated by the Scientific Adviser's Division, Ministry of Food, and J. Lyons and Co., Cadby Hall. The meat supplied to the two organisations was cut from the same animals, and was equally suitable for the work.

Both panels employed the analytical system of tasting prime cuts, whereby various characteristics were appraised and allotted scores by each member according to a scale of intensity.

In addition, the Lyons panel extended their tasting to coarser and tougher cuts, such as the topside, a joint not normally roasted.

In the 1953 experiment 3 beasts were selected from a group of 6 Polled Angus all at a high plane of nutrition, alike in age and sex, the sides of which when dressed fell within a weight range of 285

to 305 lb. The left sides of carcases marked V, E and 18 were all chilled, the right side of carcase V frozen, and the right sides of carcases E and 18 faster frozen. The faster frozen quarters were all treated as described previously. Conditions of transport to the United Kingdom were similar to those for the 1952 consignment.

The Ministry of Food panel in tasting this material employed the "direct difference test"[2] because of its comparative objectivity.

The conclusions reached independently by both panels in the two years agreed so well, that only those of the Ministry of Food's panel have been reported. These were of particular interest because of the change in the system of tasting.

Table 1.—Comparison between Chilled, Frozen, and Faster Frozen Beef. Average scores (10 tasters)

Carcase No.	Characteristic	*Chilled*		*Frozen*		*Faster Frozen*	
		5 L.V.	7th Rib	5 L.V.	7th Rib	5 L.V.	7th Rib
1.	Meat Flavour	3·9	3·4	3·4	3·7		
2.				3·6	4·9	4·6	4·4
3.		3·1	2·9			3·9	3·7
1.	Juiciness	4·6	3·9	3·8	4·4		
2.				4·1	4·7	5·4	4·1
3.		3·9	3·2			5·1	4·1
1.	Tenderness	6·0	5·9	6·1	5·1		
2.				6·0	6·0	6·9	5·8
3.		5·6	4·8			6·0	3·7

SCORING KEY

OFF-FLAVOUR	MEAT FLAVOUR	JUICINESS	TENDERNESS
0—No off-flavour	0—Tasteless	0—very dry	0—very tough
8—Off-flavour very strong	8—Strongest meat flavour	1—dry	1—tough
		2—slightly dry	2—slightly tough
		4—medium	4—medium
		6—slightly juicy	6—slighty tender
		7—juicy	7—tender
		8—very juicy	8—very tender

Table 2.—Analysis of Variance

Source of Variance	*Meat Flavour*		*Tenderness*		*Juiciness*	
	Degrees of Freedom	Mean Square	Degrees of Freedom	Mean Square	Degrees of Freedom	Mean Square
Between Tasters	8	15·54	9	19·50	9	9·24
,, Treatments ..	2	5·68	2	0·61	2	6·03
,, Joints	1	0·15	1	23·40	1	5·20
Tasters × Treatments ..	16	1·42	18	2·28	18	4·30
Tasters × Joints	8	1·58	9	1·74	9	3·59
Joints × Treatments ..	2	3·45	2	5·02	2	8·26
Tasters × Joints × Treatments	16	1·52	18	2·04	18	4·20
Residual	54	1·65	60	2·42	60	2·42
TOTAL	107		119		119	

Experimental results

The joints used for tasting in the 1952 experiment were the 5th lumbar vertebræ and the 7th ribs in each case. The same joints were used in the second experiment except on three instances involving carcases E and V. The 6th lumbar vertebræ were used in test No. 3 for comparing chilled and faster frozen joints of carcase E, and the 6th lumbar vertebræ and 8th ribs, in addition to the 5th lumbar vertebræ and 7th ribs when comparing frozen against chilled joints from carcase V in tests No. 6 and 7.

All joints in both experiments were cooked and presented to the panel under identical conditions. A gas-fired oven was used for cooking, the temperature being maintained at 300°F. until the internal temperature within the joints reached 160°F.

All samples were cooled before being tasted by the panel because previous results[3] had shown that this led to greater accuracy and discrimination by the tasters.

The panels operated as follows:

Experiment I—1952

Each member of the panel scored for characteristics such as off-flavour, juiciness, tenderness, and meat flavour. Each taster was experienced and was unaware of the history of the meat being tasted. The tests were carried out in 3 sessions, at each of which 4 samples of meat were presented, *i.e.* 2 chilled, 2 frozen; 2 chilled, 2 faster frozen; 2 frozen and 2 faster frozen. The average results are shown in Table 1 together with the scoring key. The analysis of variance used to test their significance is given in Table 2.

The panel was unable to detect any significant difference between the effect of treatments upon meat flavour, juiciness, and tenderness. There was a significant difference between the two joints in the tenderness scores; the 5th lumbar vertebræ giving consistently higher marks than the 7th ribs. The scores for lean-meat off-flavour were zero. The scores for fat off-flavour were also zero, except for one joint, the 5th lumbar vertebra from carcase 1, which had been chilled.

Experiment II—1953

In this test replicate samples of two treatments were presented at the same time to each member of the panel, who was informed in advance of the number of replications, and was asked to identify the joints from which each sample came.

The "direct difference test"[2] is not straightforward when applied to meat because of the sampling differences within any one joint. It has been used in this particular investigation with great care, and only after previous trials on meat had demonstrated its validity.

Altogether 7 tests were carried out. In each of these tests 2 joints were compared. Three samples of one joint and two samples of the other were coded at random and

presented to the panel, the method of cooking and presentation being as previously described.

The results of these tests are given in Table 3.

In such a test it is expected that one correct result in ten might result from guesswork alone, and that this number will vary slightly according to the rules of chance distribution. The final column in Table 3 shows whether the number of correct identifications indicates a significant difference between the two joints presented.

It seems that in tests Nos. 1, 2, 6 and 7, where samples differed only in that one of the two joints had been frozen and the other chilled, members of the panel failed to distinguish significantly between them after they had been cooked. In tests Nos. 3, 4 and 5, when the joints presented differed only in that one had been chilled and the other faster frozen, the panel was able to detect a significant difference only between the two joints from carcase E in test No. 3; they failed in tests No. 4 and 5 from carcase 18.

The results of test No. 3 using joints from carcase E appear anomalous. No explanation has been found. Thus in no instance was the panel able to distinguish between frozen and chilled beef of the same initial quality, nor between chilled and faster frozen beef, except in the case of the joints from carcase E.

Discussion

The interesting conclusion from the present investigation, which confirms that of Moran and Smith,[1] is that if meat is initially of the highest quality any deleterious effect by freezing is of insignificant proportions. This applies equally to prime lean cuts and coarser cuts of beef. In other words, it suggests that it is not so much the chilling process that makes chilled beef popular, but rather the better original quality of the meat.

It has been suggested that the strongly held opinion that chilled is superior to frozen beef depends on the fact that chilled meat received in the United Kingdom from overseas comes from younger and better stock, and is transported, distributed, and consumed in a much shorter time than frozen beef. In the present investigation these variations were deliberately excluded, so that a direct comparison of treatments was possible.

Although the present investigations were restricted in scope for obvious practical reasons the results do suggest lines of enquiry of sufficient economic importance to warrant their being followed to a more definite conclusion.

These include:

1. Comparison of the quality of chilled, faster frozen, and frozen meat obtained from different grades of cattle of the same age.
2. Comparison of chilled beef stored for a normal period, with faster frozen and frozen beef of the same initial quality stored for at least 6 months.
3. Consideration of the factors affecting quality, such as breed, and the feeding and treatment of stock during the month or so prior to slaughter.
4. The relative merits of freezing and faster freezing for preserving meat.

Table 3.—Comparison between Chilled, Frozen, and Faster Frozen Beef. (Direct Difference Test)

Test No.	*Carcase*	*Joint*	*Treatment*	*Number of Correct Identifications*	*Number of Tasters*	*Significance*
1.	V	7th rib	Frozen	0	8	Not significant
	V	7th ,,	Chilled			
2.	V	5th L.V.	Frozen	2	9	,, ,,
	V	5th ,,	Chilled			
3.	E	6th ,,	Chilled	7	9	Highly significant, $p < 0.001$
	E	6th ,,	Faster frozen			
4.	18	7th rib	Chilled	2	9	Not significant
	18	7th ,,	Faster frozen			
5.	18	5th L.V.	Chilled	2	9	,, ,,
	18	5th ,,	Faster frozen			
6.	V	8th rib	Frozen	0	9	,, ,,
	V	8th ,,	Chilled			
7.	V	6th L.V.	Frozen	2	10	,, ,,
	V	6th ,,	Chilled			

The author is indebted to the New Zealand Meat Producers' Board, Messrs. T. Borthwick and Sons, Ltd., W. and R. Fletcher (N.Z.), Ltd., Ellis Hardie Symington, Ltd., Shaw Savill and Albion Co., Port Line, Ltd., and the New Zealand Railways for arranging the preparation and consignment of the shipment of beef; to the Applied Mathematics Laboratory of this Department for statistical advice; to the Scientific Adviser's Division, Ministry of Food, United Kingdom, and J. Lyons and Co., Cadby Hall, for undertaking the palatability studies, and to the Director of the Dominion Laboratory, Department of Scientific and Industrial Research, Wellington, for permission to publish this paper.

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[1] T. Moran and E. C. Smith, *Spec. Rep. No. 36* Fd. Invest. Bd. London. 1926.
[2] J. M. Harries, *J. Sci. Fd. Agric.*, 1953, **4**, 477.
[3] Ministry of Food, Scientific Adviser's Division, unpublished data.

This work was undertaken by the Dominion Laboratory, Department of Scientific and Industrial Research, Wellington, New Zealand, with the assistance of the Scientific Adviser's Division, Ministry of Food, United Kingdom.

Soft Drinks

(*Concluded from page* 186)

when dealing with one variety of drink. However, an American firm has now introduced an electronic sighting machine which, it is claimed, can be used for checking various kinds of drinks.

Some suppliers to the Swansea factory

Washing machine: *Dawson Bros., Ltd.*
Fork lift truck: *Conveyancer Fork Trucks, Ltd.*
Syrup room equipment: *Stainless Steel Vessels, Ltd.*
Pumps: *Mono Pumps, Ltd.*
Vehicles: *Bedford and Commer.*
Electric vehicles: *N.C.B. Electric Vehicles.*
Glass pipeline (*Pyrex*): *James Jobling and Co., Ltd.*
Bottles: *Canning Town Glass Works.*
Essences and fruit juices: *Stevenson and Howell, Ltd.; White, Tomphins and Courage, Ltd.; Wm. Evans (Hereford), Ltd.*
Colloidal bottle-washing detergent: *British Hydrological Corporation, Ltd.*

The Chemistry of Peanut Butter Production–1

By A. F. Freeman, N. J. Morris, and R. K. Willich

(Southern Regional Research Laboratory of the Southern Utilization Research Branch, Agricultural Research Service, U.S. Department of Agriculture)

About 287 million lb. of edible-grade, raw, shelled peanuts were used in the 1952-53 season to produce peanut butter in the U.S. Despite this large scale of operation, however, little is known of the chemistry involved in the production and use of peanut butter. The following article is an abridged version of a report recently published by the authors on their research into the problem. Their results give a clearer understanding of some of the problems in manufacturing peanut butter, and may prove useful in gauging the efficiency of certain operations, and in establishing on a scientific basis conditions of processing that yield best results. The first part of the article deals with the processing and properties of peanut butter. The second part will cover palatability and preparation of peanut butter, methods of analysis, uniformity of addition of vitamin A, effect of processing temperatures and storage.

THE manufacture of peanut butter consumes as large a quantity of peanuts as all other peanut food products combined. In the 1952-53 season more than 560 million lb. of edible grade, raw shelled peanuts were reported[1] as utilised directly by the industry in the manufacture of primary products, and about 287 million lb., or 51%, were used in the manufacture of peanut butter. While reports[2,3] are found of the preparation of a paste from peanuts in various parts of the world, peanut butter was probably first used in the United States[4] as a special-diet food about 1890. Despite early use of peanuts for a product of this type in other parts of the world, peanut butter has not reached commercial importance except in the United States.[5]

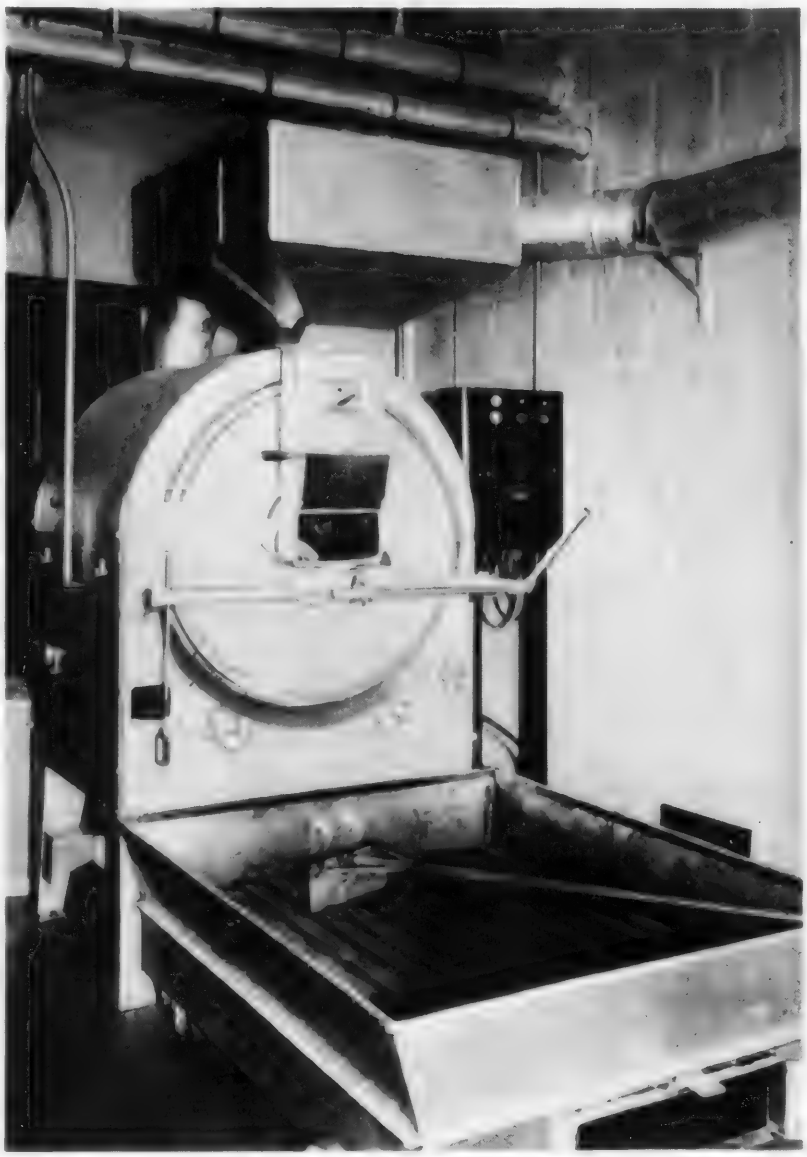

Fig. 1. Roaster and cooling car.

Manufacture of peanut butter

The essential steps in the preparation of peanut butter are, respectively, cleaning, shelling, and grading;[6] and roasting, blanching, and grinding to a pasty consistency usually with salt for flavouring.[7] Groups within this industry have adopted trading rules[8] which include definitions of commercial grades of peanuts. Most peanut butter manufacturers purchase shelled peanuts, but some operate their own shelling plants.

In the manufacture of peanut butter, the desired flavour and appearance is usually produced by roasting the shelled peanuts in gas-fired roasters, either by radiant-

Table 1. Results of Peanut Roasting Tests

Batch No.	Raw peanuts	Roasting time	Roasting temperature			Peanut butter colour		Moisture content of peanuts	
			Initial	Minimum	Maximum	Type	Designation *	Before roasting	After roasting and cooling
	lb.	minutes	°F.	°F.	°F.			%	%
1	230	17	275	230	275	very light	11-E3	5·57	2·33
2	230	23	275	205	283	very light	11-J5	6·04	2·03
3	240	21	270	205	285	light	11-G5	5·95	1·71
4	230	22	275	200	285	light	11-G5	6·79	1·92
5	230	21·5	310	205	285	light	11-G5	6·31	1·94
6	230	25	260	200	292	light	11-G6	7·04	1·41
7	234	22·5	280	200	290	medium	11-F6	6·79	1·74
8	246	21	290	210	290	medium	11-F6	6·39	1·50
9	230	26	230	200	298	medium	11-F6	6·37	1·35
10	230	24	250	200	300	medium	11-F6	6·07	1·06
11	230	23	330	215	295	dark	11-J7	6·08	1·80
12	230	26	240	200	308	dark	12-K7	6·45	1·03
13	253	25	340	205	300	dark	12-L7	6·74	1·15
14	230	29	220	200	304	dark	12-J7	6·04	1·30
15	230	24	330	210	300	dark	12-I7	6·91	1·39
16	230	25	300	205	305	dark	12-L8	6·70	1·30
17	230	20	340	240	305	dark	12-L8	6·88	1·05
18	230	21	290	215	315	very dark	13-G9	6·20	1·25
19	200	17·75	300	250	320	very dark	13-F9	6·37	1·17
20	232	22·5	300	210	320	very dark	13-F9	6·27	1·08

* Refers to colour plates in "A Dictionary of Color," by A. Maerz and M. Rea Paul, 1930 (New York: McGraw-Hill Book Co. Inc.).

heat or rapid re-circulation of hot gases over the peanuts. The roasted product is then cooled to room temperature by rapidly drawing air from the room through the hot mass. The testa (red skin) and germs (hearts) are separated by passing the roasted peanuts through a blanching machine, in which they are divided into cotyledons (peanut halves or split-peanuts), germs, and testa. The skins are aspirated away from the mixture, and the relatively small germs are separated from the cotyledons by screening. The objectionable material in the split-peanut portion, including unblanched and/or discoloured nuts and foreign matter, is removed manually at a picking table. Specific-gravity separators, or oscillating shaker-screen separators, are often used as adjuncts to this operation for removal of trash and damaged peanuts. The roasted peanuts are then ground into a smooth paste along with small amounts of salt, and sometimes sugar, for flavouring, and with peanut oil hydrogenated to various extents, or with mono- or diglycerides for the prevention of oil separation. "Chunky" peanut butters are often made by mixing chopped peanuts with the smooth product. In recent years the hot peanut butter issuing from the grinder has been cooled rapidly in continuous chilling machines in order to dissipate heat before packaging and to set the added hard fats rapidly, thereby preventing oil separation and producing a more palatable product. Peanut butter is piped from the grinder or the chilling machine to an automatic filling machine, from which it is dispensed into jars or tins. Containers are usually closed tightly and labelled by automatic machines.

The Southern Regional Research Laboratory has been conducting research on the production of peanut butter in which processing variables have been systematically investigated in an effort to evaluate their effects on the quality of the finished product.

Processing of peanut butter

Roasting. In this investigation batches of No. 1 grade[6], white Spanish peanuts were roasted in a 250-lb. capacity, gas-fired, radiant-ray roaster (Fig. 1) within the range of 220 to 340°F. The conditions used in roasting, the types of roasts produced, and the moisture content of the peanuts before and after roasting are given in Table 1. Variation of the temperature within the mass of roasting peanuts with the time of roasting is shown for three of the products in Fig. 2.

Cooling. The peanuts were cooled immediately after they were dumped from the roaster into a 44 × 58 in. cooling car (Fig. 1, foreground), fitted with a perforated screen, which supported the peanuts above the bottom of the car and permitted the free passage of air. The average depth of the peanuts in the cooling car was about 5 in. Cooling was accomplished by drawing air from the room at the rate of about 1,100 cu. ft. of free air/min. downward through the batch of nuts with a heavy-duty exhaust fan.

Blanching and sorting. The testa (red skin) and germs (hearts) were separated by passing the roasted peanuts through a split-nut blanching machine (Fig. 3) of the ribbed-roll type.[7] In this device the shelled peanuts were divided into cotyledons, germs, and testa by rubbing between ribbed-rubber surfaces. The testa was aspirated away from the mixture, and the relatively small germs were separated from the cotyledons on an oscillating tray which screened out

the germs. The objectionable material in the split-peanut portion, including unblanched and/or discoloured nuts and foreign matter, was removed manually at a six-place picking table (Fig. 4). The speed of the conveyor belt of the table was controlled by a variable-speed drive, which permitted operation at slower rates as needed and hence efficient removal of objectionable material. Results obtained from these operations are shown in Table 2.

Peanut butters. Each of these batches of blanched, sorted peanuts was ground into peanut butter at the rate of 240 lb./hr. in an 8-in. vertical attrition mill. The temperatures of the peanut butters issuing from the mill varied from about 150° to 165°F. (65 to 74°C.). Three types of peanut butter were made from each batch; Type A, containing only ground peanuts; Type B, containing added salt; and Type C, containing added salt, and hydrogenated peanut oil added to prevent oil separation. The resulting peanut butters ranged in colour from very light to very dark. The peanut butters were packaged in 8-oz. glass jars provided with lined screw caps leaving an air headspace of about 45 ml. The jars were packed in cartons and stored on shelves in a room maintained at approximately 80°F. (26·7°C.).

Table 2. Results of Blanching and Manual Sorting of Peanuts

No.	*Materials separated during blanching*			*Materials from manual sorting of the cotyledons*	
	Germs	*Skins*	*Cotyledons*	*Accepted* *	*Rejected*
	lbs. per 100 lb.	lbs. per 100 lb.	lbs. per 100 lb.	lbs.	lbs.
1	2·1	4·1	93·8	91·6	2·2
2	2·1	4·0	93·9	90·0	3·0
3	2·5	4·3	93·2	91·3	1·9
4	1·9	3·5	94·6	92·8	1·8
5	1·9	4·1	94·0	92·1	1·9
6	1·6	3·9	94·5	92·8	1·7
7	2·4	4·2	93·4	91·3	2·1
8	2·1	3·7	94·2	91·1	3·1
9	2·1	3·9	94·0	91·4	2·6
10	2·2	4·0	93·8	92·4	1·4
11	1·6	4·1	94·3	91·6	2·7
12	2·1	4·2	93·7	91·6	2·1
13	2·8	4·0	93·2	92·0	1·2
14	2·1	4·0	93·9	91·6	2·3
15	1·5	4·1	94·4	91·9	2·5
16	2·0	4·3	93·7	92·1	1·6
17	2·7	4·4	92·9	90·7	2·2
18	2·0	4·0	94·0	91·4	2·6
19	2·8	3·6	93·6	92·8	0·8
20	2·3	4·0	93·7	92·1	1·6

* Used for production of peanut butter.

Roasting, cooling, blanching and picking

Data obtained during roasting of peanuts indicated in general that the rate of heating for the equipment used was constant, and that all other conditions being equal the time of roasting for a given weight of peanuts was the most important variable affecting the character of the end product. Also, it was noted that the moisture contents of the peanuts after roasting and cooling were proportionately lower as the darkness of the colour of the roasted product increased.

Information ascertained during the cooling, blanching, and manual sorting operations indicated that for practical purposes uniformly efficient blanching was obtained for all batches, whatever the degree of roasting. It was also observed that a small but appreciable percentage (1-3%) of unblanched and/or discoloured and foreign material remained with the peanuts after the blanching operation and should be removed by a supplemental sorting operation before grinding into peanut butter.

Properties of peanut butter

Thiamine. Raw peanuts are a good source of thiamine (vitamin B_1),[9, 10] but roasted peanuts have been grouped with those foods which generally contain only a moderate amount[9] of this substance. Because of the known thermal instability[11] of thiamine and the high temperature and protracted time of heating peanuts to produce the desired colour, flavour, and aroma in peanut butter, it might be expected that there would be some decrease in the content of this vitamin in the finished product.

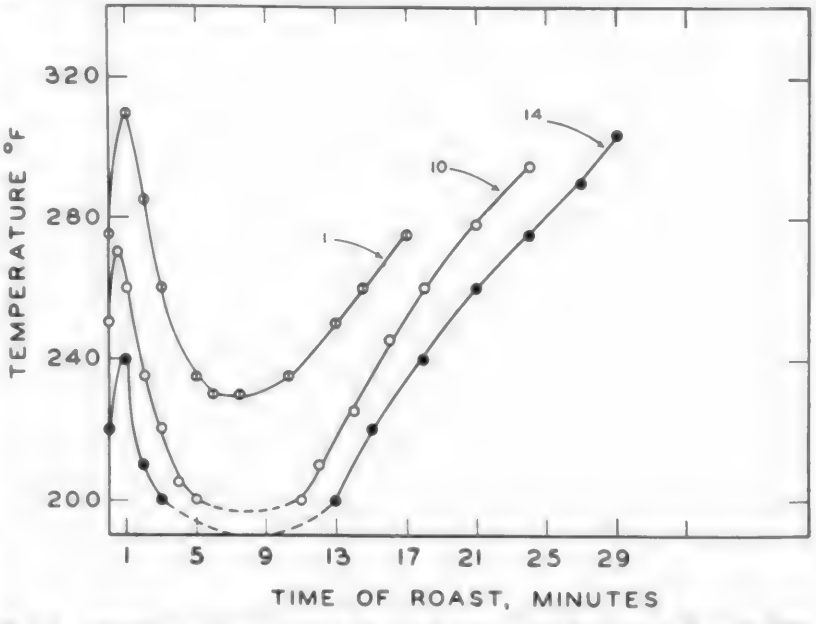

Fig. 2. Variation of temperature of peanuts (measured at bottom of mass) with time of roasting. Curves represent light (1), medium (10), and dark (14) roasts.

Fig. 3. Blanching machine.

Fig. 4. Picking table.

From 74 to 97% of the total thiamine is concentrated in the kernel of the raw shelled peanut; and the thiamine content of the peanut butters diminishes with increase of extent of roasting while the peanuts became darker. In general, butters made from light-roasted peanuts retain about 20% of the original thiamine content; those from medium-roasted peanuts less than 14%; those from dark-roasted peanuts less than 10%; and those from very dark-roasted peanuts less than 3%.[12]

Oil content and free fatty acids. The relative proportions of oil and meal in roasted peanuts are important in the manufacture of peanut butter, particularly from the standpoint of the amount of stabiliser that should be added to prevent oil separation. The free fatty acids content of the oil of peanuts is an important factor in the quality of peanut butter. Hence, the contents of oil and free fatty acids of peanuts were determined during the manufacture of peanut butter. The oil contents of peanut butters without additives, with only added salt, and with added salt and stabiliser are shown in Table 3.

Raw shelled peanuts, roasted

Table 3. Oil in Peanut Butter

Batch No.	*(A) Containing no additives oil content oven-dry basis*	*(B) Containing added salt*			*(C) Containing added salt and stabiliser*					*Difference, fat content oven-dry, additive-free basis (Type C- Type B)*
		Salt content oven-dry basis	*Oil content*		*Content of additives oven-dry basis*			*Oil content*		
			oven-dry basis	*Dry, salt-free basis*	*salt*	*oil*	*stabiliser*	*oven-dry basis*	*oven-dry additive-free basis*	
	%	%	%	%	%	%	%	%	%	%
1	50·9	1·53	49·93	50·71	1·53	—	1·5[1]	50·68	52·27	1·56
2	48·6	1·53	47·70	48·44	1·53	—	0·9[1]	48·18	49·40	0·96
3	50·7	1·42	49·9	50·59	1·39	—	0·9[1]	50·4	51·54	0·95
4	50·7	1·42	50·6	51·37	1·42	—	0·8[1]	51·0	52·17	0·80
5	50·7	1·42	50·21	50·93	0·93[2]	0·93[2]	0·93[2]	51·35	52·81	1·88
6	50·6	1·41	50·15	50·87	1·39	—	1·2[1]	50·76	52·12	1·25
7	48·5	1·52	47·9	48·68	1·3[2]	1·3[2]	1·30[2]	49·4	51·33	2·65
8	48·3	1·52	47·76	48·50	1·3[2]	1·3[2]	1·3[2]	49·48	51·69	3·19
9	49·4	1·44	48·93	49·64	1·25	—	1·7[1]	49·88	51·40	1·76
10	50·6	1·26	50·07	50·71	1·23	—	0·8[1]	50·47	51·51	0·80
11	49·8	1·42	49·5	50·23	1·4[2]	1·4[2]	1·4[2]	51·0	53·26	3·03
12	50·7	1·39	49·97	50·67	1·3	—	0·3[1]	50·1	50·93	0·26
13	50·7	1·41	50·36	51·08	1·4	—	0·8[1]	50·77	51·94	0·86
14	48·8	1·50	48·3	49·06	1·5	—	0·9[1]	48·8	50·02	0·96
15	50·3	1·41	49·6	50·31	1·5[2]	1·5[2]	1·5[2]	51·2	53·73	3·42
16	50·7	1·41	50·3	50·97	1·38	—	0·97[1]	50·7	51·96	0·99
17	50·8	1·41	50·5	51·24	1·5[2]	1·5[2]	1·5[2]	51·8	54·06	2·82
18	48·6	1·51	48·1	48·83	1·2[2]	1·2[2]	1·2[2]	49·6	51·43	2·60
19	50·4	1·41	50·13	50·85	1·41	—	1·5[1]	50·89	52·41	1·56
20	51·0	1·51	50·5	51·26	1·4[2]	1·4[2]	1·4[2]	51·8	53·92	2·66

[1] A commercial grade of hydrogenated peanut oil [ca. mp. 64·5°C. (148°F.) and iodine value of ca. 8].
[2] A commercial grade of peanut butter stabiliser composed of an equal weight mixture of salt, peanut oil, and hydrogenated peanut oil.

Table 4. Analysis, Composition, and Stability of Peanut Oils

Sample No.	Initial peroxide value[1]	Stability—AOM hours		Thiocyanogen value	Iodine value	Fatty acid composition			Tocopherol content		
		Test[2]	Extrapolated[3]			Linolein	Olein	Saturated glycerides	Total[4]	α	γ[5]
						%	%	%	%	%	%
1S	5	20·5	29	71·5	101·6	37·0	43·5	19·5	0·039	0·021	0·018
2S	2	30·0	32	71·3	98·2	33·1	47·6	19·3	0·041	0·024	0·019
3S	7	28·0	32	70·7	98·5	34·1	45·7	20·2	0·038	0·023	0·015
4S	4	26·0	29	70·7	98·9	34·6	45·2	20·2	0·043	0·026	0·017
5S	2	30·0	32	70·3	98·4	34·5	44·9	20·6	0·041	0·025	0·016
6S	4	30·5	34	72·0	98·0	31·9	49·7	18·4	0·039	0·024	0·015
7V	5	28·5	32	74·9	101·3	32·4	52·5	15·1	0·046	0·026	0·020
8V	3	32·5	36	75·5	99·1	28·9	57·0	14·1	0·044	0·025	0·019
9V	7	30·0	36	73·8	95·4	26·4	57·7	15·9	0·043	0·023	0·020
10V	5	30·5	35	73·8	98·3	30·0	53·8	16·2	0·041	0·025	0·016
11V	2	41·0	44	73·4	97·6	29·6	53·7	16·7	0·041	0·025	0·016
12V	3	31·0	36	73·3	98·1	30·4	52·9	16·7	0·041	0·026	0·015
13R	2	48·0	49	73·8	90·2	19·9	64·7	15·4	0·048	0·030	0·018
14R	3	36·5	44	74·4	91·8	21·2	64·2	14·6	0·048	0·029	0·019
15R	4	32·5	38	74·5	94·1	23·9	61·3	14·8	0·052	0·029	0·023
16R	4	36·5	41	73·9	92·8	23·0	61·5	15·5	0·053	0·030	0·023

[1] Milliequivalents of peroxide/kg. oil
[2] Time required by oil to attain a peroxide content of 100 milliequivalents/kg. oil during aeration at 97·8°C. with an air flow of 2·33 ml./sec.
[3] Obtained by extrapolation of peroxide accumulation curves to a peroxide value of zero.
[4] Determined by the Parker and McFarlane modification of the Emmerie and Engel method using a 2½-min. reaction time.
[5] Determined by Fisher method using Parker and McFarlane treatment.
R—Runner peanuts. S—Spanish peanuts. V—Virginia peanuts.

Table 5. Variations in Colour of Peanut Butter with Variation in Extent of Roasting

(Data obtained from reflectance spectrophotometric curves)

No.	Peanut butter colour		I.C.I. designation			Psycho-physical attributes			Munsell renotations		Hunter scale numbers		
	Type	Designation[1]	Tristimulus value Y	Trichromatic co-ordinates x	y	Reflectance	Dominant wavelength	Excitation purity	Hue	Value/chroma	Luminous reflectance Rd.	a	b
						%	mμ	%			%		
1	very light	11-E3	0·38197	0·3634	0·3704	38·2	577	28·9	12·9YR	6.65/3·1	38·2	0·08	17·70
2	very light	11-J5	0·50647	0·3914	0·3862	50·6	580	40·5	10·7YR	7·50/5·2	50·6	4·26	25·91
3	light	11-G5	0·28154	0·3824	0·3777	28·2	580	35·8	10·9YR	5·83/3·7	28·2	3·28	18·66
4	light	11-G5	0·40030	0·3916	0·3838	40·9	580	40·0	10·5YR	6·67/4·7	40·9	4·71	23·42
5	light	11-G5	0·38869	0·3958	0·3852	38·9	581	41·3	10·0YR	6·70/4·9	38·9	5·46	23·60
6	light	11-G6	0·30442	0·3873	0·3812	30·4	580	38·1	10·8YR	6·03/4·1	30·4	3·76	20·68
7	medium	11-F6	0·42995	0·4051	0·3880	43·0	582	44·7	9·3YR	6·81/5·5	43·0	7·69	25·96
8	medium	11-F6	0·39713	0·4108	0·3898	39·7	583	48·4	8·3YR	6·76/6·2	39·7	10·39	26·60
9	medium	11-F6	0·21002	0·3987	0·3824	21·0	582	41·5	9·8YR	5·13/4·1	21·0	5·77	18·72
10	medium	11-F6	0·36028	0·4162	0·3902	36·0	583	48·3	8·5YR	6·49/5·9	36·0	9·73	25·64
11	dark	11-J7	0·29900	0·4052	0·3864	29·9	582	44·3	9·3YR	5·99/5·0	29·9	7·19	22·40
12	dark	12-K7	0·22522	0·4149	0·3886	22·5	583	47·5	8·8YR	5·29/4·9	22·5	8·29	21·30
13	dark	12-L7	0·21748	0·4164	0·3892	21·7	583	48·1	8·8YR	5·21/4·9	21·7	8·38	21·22
14	dark	12-J7	0·18877	0·4135	0·3870	18·9	583	46·7	8·9YR	4·90/4·5	18·9	7·85	19·70
15	dark	12-I7	0·24685	0·4154	0·3865	24·7	583	47·0	8·4YR	5·51/5·1	24·7	9·26	21·79
16	dark	12-L8	0·21610	0·4215	0·3901	21·6	583	49·7	8·4YR	5·20/5·2	21·6	9·37	21·69
17	dark	12-L8	0·22058	0·4257	0·3841	22·1	585	49·3	7·1YR	5·11/5·3	22·1	12·07	21·47
18	very dark	13-G9	0·20948	0·4299	0·3868	20·9	585	51·1	7·2YR	5·13/5·5	20·9	12·14	21·73
19	very dark	13-F9	0·18485	0·4374	0·3829	18·5	587	52·0	5·9YR	4·73/5·5	18·5	14·34	20·91
20	very dark	13-F9	0·12497	0·4255	0·3756	12·5	587	46·8	6·0YR	4·08/4·3	12·5	11·64	16·52

[1] Refers to colour plates in "A Dictionary of Color," by A. Maerz and M. Rea Paul, 1930, McGraw-Hill Book Co.

shelled peanuts, germs, testa, sorted cotyledons, and the three types of peanut butters (referred to previously) made from the sorted cotyledons were analysed for moisture and oil contents. The oils extracted from these samples were analysed for free fatty acids content.[13]

Results indicated (Fig. 5) that the roasted peanut kernels have a higher percentage of oil than the corresponding raw kernels, the difference presumably being occasioned by loss of volatile matter in addition to moisture during roasting or by some effect on the non-oil portion of the peanut. Also, the data show that the sorted cotyledons have a higher percentage of oil than the roasted kernels, the difference undoubtedly being occasioned by the separation of components of lower oil content, *i.e.*, the testa and heart. The oil content of the testa removed from the peanuts after roasting was

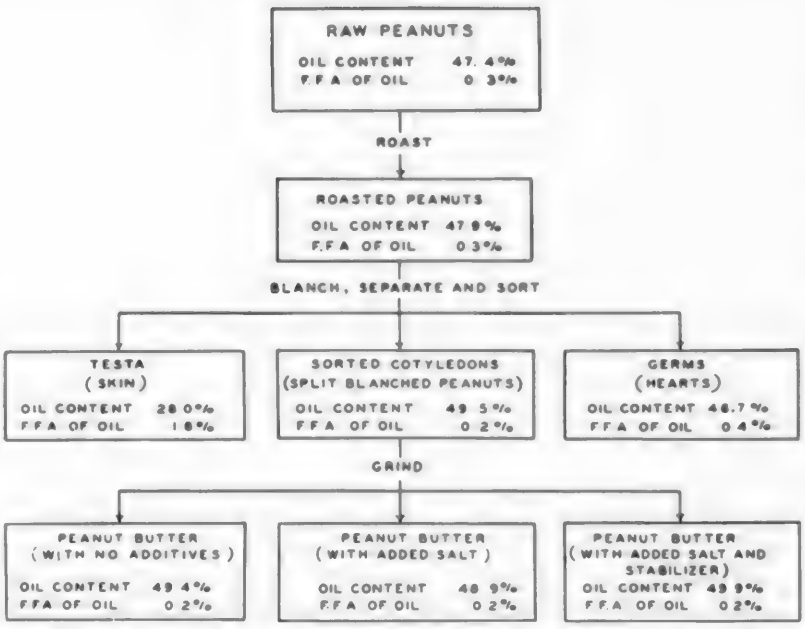

Fig. 5. Oil and free fatty acids in the manufacture of peanut butter (Batch No. 9).

found to be quite high (28%). Because the skin of raw peanuts has been found[14, 15] generally to contain a very low percentage of oil, it was concluded that the skin absorbed oil exuded from the peanut during roasting and blanching.

Furthermore, data obtained in this work reveal that the free fatty acid contents of the oils extracted from raw and roasted peanuts, sorted cotyledons, and the three types of peanut butter were uniformly low. Also, Fig. 5 shows that the testa and the germs, the materials eliminated during blanching and separating, are relatively high in free fatty acids. The results of removing these materials are that the finished product is lower in free fatty acids than the roasted peanuts.

The effect of increase in oil content is to produce a smoother and less sticky product. Data from previous work[16] furnished information for calculation of a materials balance during the manufacture of peanut butter. In the manufacture of Batch No. 9, 100 lb. of raw peanuts yielded 94·9 lb. of roasted peanuts, which on blanching, separating, and sorting furnished 3·7 lb. of testa, 2·0 lb. of germs, 2·5 lb. of objectionable or extraneous material and 86·7 lb. of sorted cotyledons for grinding into peanut butter. By removal of the 3·7 lb. of testa and the 2·0 lb. of germs the free fatty acids content of the finished product was reduced by 30%, while the oil content was increased approximately 2%. These by-products are a rich source of oil since the 5·7 lb. of testa and germs contain 2 lb. of oil (37%).

Chemical evaluation for stability of oils to rancidity. Stability of oils[17, 18, 19] of peanuts and peanut products may be used to indicate the relative susceptibility or resistance of the products toward autoxidative rancidity. Stability is expressed arbitrarily as the time elapsing before the onset of rancidity during which the oil is subjected to specified conditions.

Varieties. As a result of observations that products made from different types of peanuts vary in their resistance to oxidative deterioration, an investigation was made to determine whether these differences could be attributed to fatty acid composition, or other characteristics, particularly content of tocopherols, the natural antioxidants in crude oils. In this work the oils of 16 varieties of raw shelled peanuts, including Spanish, Virginias, and Runners, were analysed for initial peroxide value and stability, tocopherol content, and saturated, linoleic, and oleic glyceride contents in order to determine factors that might affect the stability of crude peanut oil.

In general, data[20] (see Table 4) indicated that the stability of the crude oil was greatest for the oils containing the smallest amounts of linoleic acid.

It may be concluded from these results that products made from peanuts containing oils of relatively low linolein content and of high stability would have an increased shelf-life.

Peanut butters. The stabilities of the oils of the various peanut butters produced from Spanish peanuts in the laboratory pilot plant were determined at the time of manufacture and periodically over two years as the products were stored at 80°F. It was ascertained[21] in general that the stabilities of the oils of the freshly prepared products were high (see Figs. 6 and 7), and that no troublesome decrease in stability of the oils occurred, even when the peanut butters were stored as long as two years. Neither the addition of salt, or salt and various stabilisers, nor the extent of roasting accorded the peanuts produced any reduction in the stability of the oils of the products.

These observations seem to indicate that autoxidation of the oils of the peanut butters proceeded until the available supply of oxygen in each jar had been depleted, and that thereafter no significant change in stability occurred. It was noteworthy that these results were obtained on peanut butters prepared from Spanish peanuts, the oil from which has been found generally to have the lowest stability of the varieties tested.[21]

Objective determination of the colour of peanut butter. Research[22] aimed at development of a method for designation of colour of peanut butter establishes that the colours of peanut butter can be measured objectively by reflectance spectrophotometry.

As shown in Table 5, in general, the x-trichromatic co-ordinate, the redness factor, was found to increase with increase of extent of

roasting. The medium and dark peanut butters had *x*-co-ordinates of not less than 0·40 nor greater than 0·42. In the Munsell renotations the magnitude of the expression for *hue* was considered the best criterion of colour. The magnitude of *hue* increased rapidly for the under-roasted products, and decreased rapidly for the over-roasted products. The range for the eleven medium and dark peanut butters measured from 7·1 YR to 9·8 YR. In Hunter colour and colour difference terms the *a*-co-ordinate is most analogous to the C.I.E. *x*-co-ordinate, the redness factor. A medium or dark peanut butter was found with a single exception to have an *a*-co-ordinate between 5·77 and 12·07. Information obtained in this work provides the basis for measurement of the colour of peanut butter with less complicated and less expensive equipment.

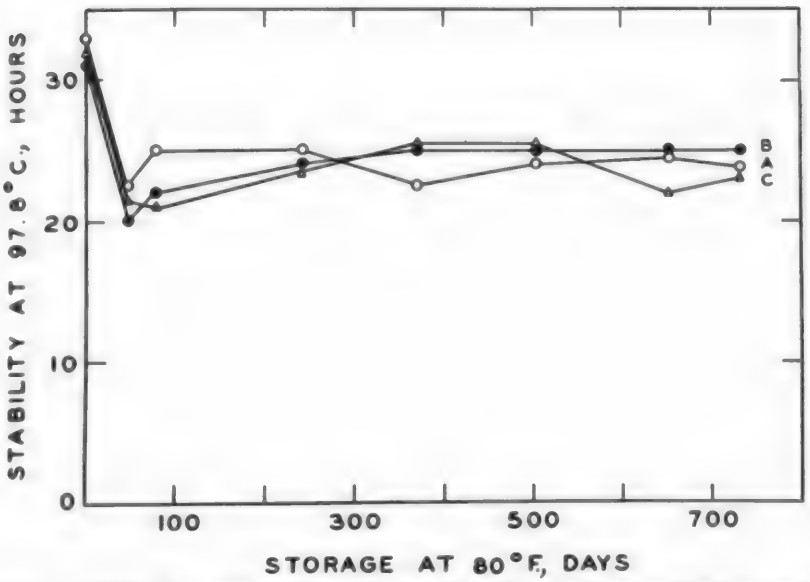

Fig. 6. Effect of storage on the stability of oils in light, medium, and dark roasted peanut butters. Curve 3 represents Type A peanut butter (control—no additives) from light roasted peanuts; curve 9 represents Type A peanut butter from medium roasted peanuts; curve 16 represents Type A peanut butter from dark roasted peanuts.

Prevention of oil separation. The gravitational separation of peanut butter[23] into an oil phase and a meal phase occurs because of the difference in specific gravity of the solid particles and the oil comprising the product, and gives rise to the practice of incorporating hydrogenated peanut oil for the purpose of overcoming this separation.

Before 1948 the majority of manufacturers producing "stabilised" peanut butters preferred to add hydrogenated peanut oil alone, either in granular or melted form. Recently, several suspensions of hydrogenated peanut oil and salt in peanut oil[24, 25] have been developed, and used in the production of peanut butter. The principal advantage of the hard fat-salt-oil mixtures is the fact that they are pumpable, and hence distribution and the amount of stabiliser and salt being incorporated can be controlled more precisely. The total content of oil in peanut kernels may range from 44-56%[15] according to the type and quality, but only part of the oil is liberated from the peanuts[26] during the manufacture of peanut butter. The specific amount liberated depends upon the grinding procedure employed which determines the quantity of hydrogenated peanut oil that needs to be added.[27]

Since crystals of fat are not present in the natural oil of peanut butter at ordinary temperatures, hydrogenated peanut oil, which is crystalline at these temperatures, is mixed uniformly with the product to provide such crystals. In a satisfactory stabilised peanut butter, crystallisation of the added fat (hydrogenated peanut oil) takes place generally throughout the product before the oil-meal mixture can separate. Only enough hard fat need be incorporated in the product to ensure the presence of sufficient crystals at room temperature to entrap the natural oil.

The lower melting crystal-forms of hydrogenated peanut oil have the maximum ability to stabilise peanut butter. Rapid chilling, which produces the lower melting forms, results in greater quantities of solids and hence more effective prevention of oil separation. In addition, crystals of these forms are finely divided, a condition which contributes toward a smoother product. Also, the lower melting forms are considered desirable because they melt nearer to body temperature thereby minimising the tallowy or unctuous sensations attributed to hard fats.[28]

Dilatometric measurements on peanut butter

In consideration of reports that oil separation had been experienced in peanut butters manufactured to contain supposedly adequate amounts of hydrogenated peanut oil, aspects of this subject were investigated. From dilatometric data on peanut butters it was concluded[29] that the effectiveness of hard fat incorporated in peanut butter was dependent upon the amount dissolved and its distribution throughout the oil in the product. The content of hard fat in peanut butter must be increased in cases of relatively high processing temperatures.

They also support at least one current industrial practice of adding stabiliser, so that the hydrogenated peanut oil constitutes at least 5% of the total fat content and about 2·5% of the total mass of peanut butter. In such a process, peanuts are finely ground at the rate of about one ton/hr. with from 6 to 7% of a pumpable suspension composed approximately of 41·5% hydrogenated peanut oil, 41·5% peanut oil, and 17%

salt. The mass may issue from the grinder between 165-200°F. (74-about 80-100°F. (26-38°C.) in a about 80—100°F. (26-38°C.) in a continuous chilling machine[30] immediately before packaging. The relatively high proportion of hydrogenated peanut oil mixed with the peanut oil results in relatively rapid crystallisation under such conditions, so that separation of oil does not occur.

Ward, Singleton and Freeman reported the heat capacity of stabilised peanut butter[31] over the range of temperature from 32° to 176°F. (0-80°C.) and found that about 0·7 B.t.u. of heat must be removed from each pound of the product in order to lower the temperature 1°F., or expressed in metric units about 0·4 cal./g./°C.

(To be continued)

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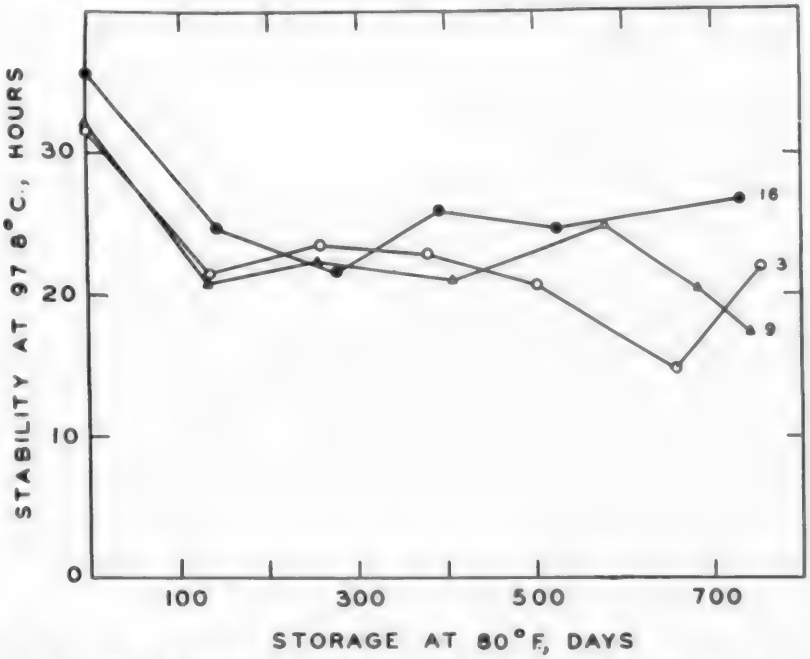

Fig. 7. Effect of storage on the stability of oils in peanut butters (Batch 13), containing various additives: (A) Control—no additives; (B) Containing salt; (C) Containing salt and hydrogenated peanut oil.

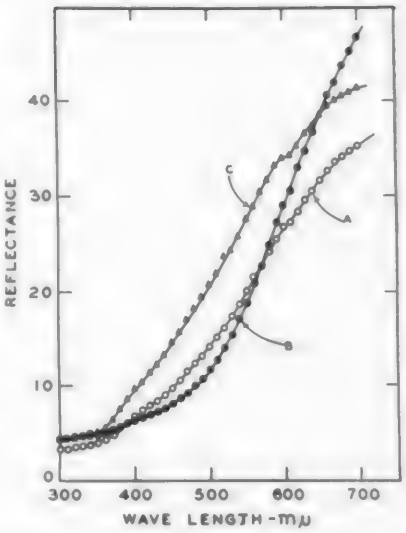

Fig. 8. Colour changes due to extent of roasting. (A) Peanut butter No. 9. (B) Peanut butter No. 18. (C) Peanut butter No. 3.

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Open-surface milk coolers

The British Standards Institution has published a standard (B.S. 2587: 1955) for open-surface milk coolers. Materials for construction, certain design features (particularly from the hygienic aspect) and standard conditions for rating tests are specified. Milk coolers are classified for both raw and pasteurised milk, and for use with various means of cooling. Refrigeration equipment required for chilled coolants is not included, but relevant British Standards on this subject are listed. Guidance on the installation, maintenance and operation of milk coolers, together with notes on the use of calcium chloride brine, are given in the appendices.

The standardisation of In-can coolers is also under consideration.

The standard is obtainable from the sales branch of the Institution, 2, Park Street, London, W.1, price 3s. 6d. net.

Widening Horizons of Food Research

Meat, fish, eggs, fruit, grain, flour, bread, biscuits, chocolate and confectionery are among the principal foods currently being studied by the Food Investigation Organisation and other research laboratories of the D.S.I.R. Blast tunnel freezers, vertical plate freezers, a jelly tester, and the steam flow closure method of canning are some of the items of food engineering and instrumentation which have been investigated. Here is a summary of current food research in Britain taken from the latest annual report (1953-54) of the Department of Scientific and Industrial Research.

RECOMMENDATIONS for the use of the increased funds available to the D.S.I.R. are made by the Advisory Council in the report for 1953-54 (H.M.S.O., 9s. net). These resources, which became available under the Five Year Plan reported last year, will not be used as "an arbitrary 'dole' to be applied to the Department's work" announces the Council, but as "an acceptable current assessment of the share of Government expenditure." They will be used to meet a changing situation, and the relative importance of work will constantly be reviewed.

The report summarises and reviews the work carried out by the research organisations and associations of the Department.

A standing consultative committee on food research has been established for liaison between the Food Investigation Organisation and the formidable number of establishments concerned with the various aspects of food production, manufacture, storage, preservation and marketing. The committee is composed of members of the various related research associations and meets quarterly for the discussion of common problems.

Dehydrated meat

One of the factors affecting fresh meat quality is the consistency of the fat. It has already been established that the firmness of the fat of beef cattle increases as fattening proceeds, and it has now been found that the same applies to the fat of sheep. One reason why mutton fat is firmer than beef fat is that sheep are generally killed in a fatter condition than are beef cattle.

When cooked minced meat is dried and canned, a brown discoloration and later, a stale flavour develops, due to a chemical reaction between glucose and amino compounds. It was found that during the cooking of the whole pieces of meat the glucose passes into the cooking liquid, from which it can later be removed by a fermentation process. The liquid is then returned to the cooked meat after it is minced and the whole mass is dried. The keeping qualities of the dehydrated meat can thus be considerably improved and the browning and stale flavour almost entirely prevented.

Blast tunnel freezers

Co-operation between the Low Temperature Research Station and the Commonwealth Scientific and Industrial Research Organisation in Australia to investigate the quality of frozen and chilled beef is continuing. Experiments have been made on the chilling of beef in blast tunnel freezers, which indicate that while there is little danger that the use of these freezers will damage beef by freezing it before *rigor mortis* occurs, it has yet to be shown that such early freezing is desirable. It may, in fact, be better to hold meat in the chilled condition for some days in order to condition it (*i.e.* allow it to become more tender) before freezing.

Detecting washed eggs

Several methods have been proposed for the detection of washed eggs, *i.e.* dirty eggs washed on the farm which may cause bacterial rotting during storage. Ideally, only eggs that are naturally clean should be stored. It is known that washing decreases the amount of potassium chloride on the shell, and it has now been found that it also depletes the shell of magnesium so that most washed eggs can be identified by testing for the presence of this element. However, it was found that about 96% of eggs could be correctly identified by a chloride test based on the photochemical reduction of silver chloride in ultraviolet light.

Freezing fish at sea

The vertical plate freezer mentioned in last year's report is to be tried out. Plant to freeze the first part of the catch of an Arctic trawler is planned as part of a joint experiment between the White Fish Authority, the Ministry of Agriculture and Fisheries and the Humber Trawler Owners' Distant Water Development Committee and the Torry Research Station, who will supervise the planning and operation of the installation.

Laboratory experiments have established that fish can be kept in ice for up to three days before freezing. Further trials showed that samples of cod which had been frozen after holding in ice for different periods, proved very acceptable, either when sold as fresh fish or as raw material for freezing on land or for smoke-curing. Thus, freezing fish at sea not only makes better quality possible, but utilises more of the catch by providing fish suitable for subsequent processing on land.

Obviously trawlers will not install equipment for freezing at sea unless it is profitable to do so, and one of the objects of these trials will be to enquire into this aspect.

Fish quality

Studies on the quality of iced white fish show it to be related to the production of total volatile bases and trimethylamine which take place in fish muscle during storage and cause spoilage.

Work is also being carried out on the effect of certain constituents of fish muscle on the palatability and other factors of the flesh. A new muscle enzyme, anserinase, has been discovered which is concerned in the metabolism of anserine, an important constituent of muscle.

A new technique, using antibiotics, has been used in the taxonomy of the marine bacteria which overcomes the peculiar problems associated with this study. The technique enables the pigmented and non-pigmented *Pseudomonadeæ* to be quickly separated from each other and from the *Vibrio* species. The *Achromobacter* species can also be separated from the non-pigmented Gram-positive and Gram-negative *Bacterium* species. This is an important contribution to bacteriology as well as a discovery which should facilitate work on the problems concerned with bacterial spoilage of fish.

A specially designed diesel electric trawler is being built to meet the research needs of the Torry Research Station.

Surplus herring

Research on the utilisation of surplus herring, carried out on behalf of the Herring Industry Board continues, and manufacturing methods for the conversion of surplus herring to oil for edible purposes and to meal for animal feeding have been established on a sound basis. Methods are being devised to preserve stocks of raw materials in times of glut.

Lenticel rotting of apples

The comparatively recent but no less serious loss to British growers of Cox's Orange Pippin apples through lenticel rotting during storage has been investigated. Although rotting develops during storage, the infection starts in the orchard. Sources of infection, the way in which the fungal spores are spread, and the factors which influence the extent of infection are being studied. So far, the types of canker and die-back produced on apple trees by *Glœsporium* species—responsible for lenticel rotting—have been identified and can be recognised. Inoculation experiments have shown that twigs of Cox's Orange Pippin trees are infected more rapidly than those of Bramley's Seedling. Cankers caused by inoculation in May produced viable spores in June and continued to do so throughout the season and the following winter. Samples of fruit from badly cankered trees were found to suffer considerably more rotting during storage than fruit from trees without obvious cankers. Apples grown in different orchards as well as apples of different varieties show differences in susceptibility to rotting. Spraying trees in the late summer appears to decrease the subsequent rotting. Modifications in storage conditions likely to delay rotting must also be considered. The effect of cultural conditions on the incidence of lenticel rotting and other storage disease are being investigated in co-operation with the East Malling Research Station.

Large apples more susceptible to scald

Studies on the causes of scald in apples are complicated by the fact that the same variety of apple tends to show different types of skin injury in different seasons. However, it is now clear that apples are more susceptible to scald during exceptionally fine summers and that the larger the apple and the earlier it is picked, the greater is the risk of scald. With early picked apples the only satisfactory precaution is to wrap the fruit in oiled papers. However, this often produces skin lesions in late-picked apples. The risk is greater if there is an inadequate rate of movement of air inside the store.

Some facts of practical importance have emerged from the more academic study of the problem, particularly the rate of production of ethylene and other volatile substances by the fruit during storage. Usually there is a gradual increase of ethylene up to about the 75th day of storage, after which it can be removed by ventilation as soon as it is formed. When this is so, the apples remain relatively free from injury. On the other hand, the concentration of ethylene may continue to increase during the whole storage period, and when this happens the incidence of scald is serious. This phenomenon and certain hypotheses to account for it are being studied

Weight loss of stored apples

Another problem which causes fruit growers some concern is the loss in weight of stored apples due to evaporation of water. Measurements are being made of the loss of water from apples in commercial stores, and the storage conditions which affect loss of water are also being investigated in a 10-ton store at the laboratory.

The mobile refrigeration unit described in last year's report is proving very useful for studying the storage and transport of soft and stone fruits and of vegetables.

Ascorbic acid

Work is also being carried out on the phenolic constituents and the ascorbic acid content of plants. The economic possibilities of using ion-exchange processes for the preparation of ascorbic acid and other useful plant constituents are being studied. Research is also taking place on the metabolism of potatoes and peas.

(To be continued)

The Browning of Salt Cured White Fish

By J. M. Shewan

(Torry Research Station, Food Investigation Organisation, Department of Scientific and Industrial Research)

In recent years there has been an increasing number of complaints from the salt-fish trade concerning a brown discoloration of the surface of salted white fish. In dry salting this discoloration first becomes evident at the "wet stack" or "kench" stage and at first is mainly confined to the surface of the fish, which assumes a bright yellow-brown colour, and later becomes reddish-brown. The discoloration which can also occur in pickle salting is still evident after final drying. On cooking the desalted fish, e.g. steaming in a casserole, the colour deepens considerably to a dark brownish-red. Since it can occur even when very fresh fish are salted, this type of discoloration is quite distinct from the muddy-brown colour that permeates the flesh of fish that have been slightly decomposed at or during salting and that in consequence yield poor quality products. The trade, however, apparently does not distinguish between the two types of discoloration, and, of course, fish showing browning of any description fetch lower prices. Considerable financial losses have been incurred by the industry here and elsewhere, e.g. Iceland[1] owing to this type of surface browning. In this article the author describes the results so far achieved by recent research on the problem.

IN 1950, a cargo of cod salted at sea on board a trawler was found on landing to have undergone marked superficial browning and the Torry Research Station was called in to investigate the problem. A series of experiments was then initiated, but owing to the pressure of other work, progress was slow and after a year the project had to be temporarily abandoned. During this time, however, although the cause of the browning had not been discovered, some important data were obtained, which may be summarised as follows:

1. Not all the curing salts tested caused browning of fresh cod and some very pure salts caused none at all. This latter finding was somewhat surprising in view of the fact that some workers[2] had maintained that a type of browning, "jaune," of salted cod, was in some way related to a lack of calcium and magnesium in the curing salts.

On the other hand, it was found that some apparently very pure salts, containing almost 99% NaCl, caused marked browning (see Table 1), which could not, however, be delayed or prevented by the addition of calcium and magnesium salts.

2. The addition of iron salts did not cause brown discoloration. Canadian workers[3] had shown that salts containing about 50 p.p.m. of iron caused a detectable degree of discoloration after three months' storage, and recommended that salts containing more than 30 p.p.m. iron in the soluble form should not be used. The salts used in the industry, however, rarely contain more iron than this. (See Table 1 and Arnesen.[1])

In our experiments, the addition of both ferrous and ferric salts in concentrations up to about 100

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Fig. 1. The fish on the right shows no discoloration; the fish on the left shows four patches of browning (dark areas) where traces of copper have been added.

Table 1. Chemical Composition of Salts used for Curing

	Type of salt	Manufactured crystal (No. 3)	Manufactured crystal (No. 4)	Solar	B.P. quality	Manufactured crystal (No. 2)
	% Composition	%	%	%	%	%
	H_2O	5·8	5·8	3·3	0·02	6·7
	$CaSO_4$	1·0	1·2	1·1	0·13	0·90
	Na_2SO_4	0·115	0·195	0·03	0·20	0·05
	$MgCl_2$	0·02	0·02	0·06	TR*	0·03
	Insol in H_2O ..	0·05	0·09	0·07	0·025	0·06
	K_2SO_4	0·007	0·007	0·08	0·025	0·06
	Na_2CO_3	Nil	Nil	Nil	TR*	Nil
	NaCl (by difference)	98·81	98·40	98·66	99·62	98·93
Elements determined by spectrographical method	Fe in p.p.m.	22·0	22·0	50·0	2·0	2·0
	Cu ,, ,,	< 10·0	< 10·0	< 10·0	< 10·0	< 10·0
	Br ,, ,,	< 2·0	< 2·0	60·0	60·0	20·0
	I ,, ,,	< 0·002	< 0·2	1·0	1·0	1·0
	Sr ,, ,,	127·0	127·0	127·0	51·0	59·0
	Co ,, ,,	< 0·005	< 0·005	< 0·003	< 0·005	N.D.†
	Ni ,, ,,	0·06	0·05	0·05	0·69	,,
	Mo ,, ,,	0·01	0·01	0·01	0·01	,,
	Pb ,, ,,	0·4	0·5	0·3	0·3	,,
	Sn ,, ,,	0·08	0·05	0·08	0·15	,,
	Zn ,, ,,	1·0	2·4	1·1	—	,,
	V ,, ,,	0·02	0·01	0·04	0·007	,,
	Ti ,, ,,	0·00	0·08	0·4	0·1	,,
	Cr ,, ,,	0·05	0·04	0·07	0·005	,,
	Ag ,, ,,	0·007	0·008	< 0·005	< 0·005	,,
	Ba ,, ,,	< 30·0	< 30·0	< 30·0	< 30·0	,,
	Mn ,, ,,	< 100·0	< 100·0	< 100·0	< 100·0	

* TR = Trace.
† N.D. = Not determined.

Browning of Salt Fish—using three of the above Salts

Type of salt	North Sea cod	6 days in salt at + 10 to 12°C.	13 days in salt at + 10 to 12°C.	30 days in salt at + 10 to 12°C.	2 years in salt at + 2·5°C.
Manufactured crystal (4) ..	*Fresh*	Definite signs of browning	Very brown	Very brown	Definite browning
	Stale	No browning	No browning	Some slight browning	Definite browning
Solar	*Fresh*	No browning	No browning	No browning	Perhaps slight browning
	Stale	No browning	No browning	No browning	Definite browning
Pure (B.P.) ..	*Fresh*	No browning	Very slight traces of browning	Definite browning	Definite browning
	Stale	No browning	No browning	Patches of browning	Definite browning

p.p.m. failed to produce the characteristic browning complained of by the trade. The avoidance of steel knives for splitting and trimming the fish was also ineffective in preventing discoloration.

3. Browning was unaffected by the presence of organic matter, living or dead, in the curing salts. Salts, some of which caused browning and some not, were both autoclaved to destroy living micro-organisms and heated to red-heat to destroy all organic matter. In no instance had either treatment any effect on the development or intensity of browning.

4. The speed of development and the intensity of browning reached appeared to depend on the area in which the fish were caught. Repeated experiments using North Sea and Arctic caught cod, showed that the latter browned more quickly and to a greater extent than those taken from the North Sea. It is known that there are differences, among others, in chemical composition between North Sea and Arctic cod. Thus Arctic fish contain about twice as much trimethylamine oxide as the same species in the North Sea; and it was considered possible that this substance might in some way be related to browning. However, when salted, very stale Arctic and North Sea cod, which contained virtually no trimethylamine oxide owing to bacterial decomposition, still showed some browning. There was some evidence, however, that the stale fish became brown more slowly. Thus, in one experiment, very fresh North Sea fish, 12 hr. in ice, were quite discoloured after 30 days salting at room temperature, whereas similar fish salted after 16 days in ice were just beginning to go brown after 30 days. A second experiment with North Sea fish after 1, 7, 13 and 20 days in ice showed that after two months' salting, the onset of browning was somewhat delayed only in the stalest, 20 days iced, fish; while a similar experiment with Arctic cod salted after a few hours (at sea), 8, 12, 18 and 29 days in ice, again showed a progressive delay in the onset of browning, which was very marked in the stalest, 29 day iced fish. It was in this experiment that the difference in browning between Arctic and North Sea cod was first noted. Even with the solar salt which normally led to little or only traces of browning in North Sea fish, very definite discoloration occurred in the Arctic cod.

As a result of all the above experiments, it was concluded that probably some trace element was the cause of the phenomenon. In order to test this hypothesis, a fairly complete chemical analysis of several curing salts, some associated with browning and some not, was carried out with the help of a large firm of salt producers and the Spectrographic Department of the Macaulay Institute for Soil Research, Aberdeen. These results (see Table 1) showed no striking differences in the composition, apart from the iodine, bromine and strontium contents. Even here, however, the differences did not always point in the same direction.

It was known that the spectrographic method was not very sensitive for the trace elements barium, manganese and copper; and so far as copper is concerned could not in fact detect differences between 0 and 10 p.p.m. This was unfortunate, in view of the later findings on the rôle of copper in

Table 2. Browning of Salt Fish During Storage at 10° to 12°C.

Type of salt	*Copper in the salt in p.p.m. (average 12 samples)*	*11 days in salt*	*15 days in salt*	*22 days in salt*	*42 days in salt*	*Type of fish salted*
(A) Solar (1)	0·4	No browning	No browning	No browning	No browning	Fresh North Sea cod (1 day iced)
(B) Pure (A.R.)	0·2	No browning	No browning	No browning	No browning	
		8 days in salt	*18 days in salt*	*36 days in salt*	*60 days in salt*	
(C) Solar (2)	0·2	No browning	No browning	No browning	No browning	1 day iced North Sea 8 ,, ,, Bear Island 8 ,, ,, Iceland
(D) Manufactured vacuum (A)	3·8	Marked browning	Very marked Browning surface Deep brown-red colour	As for 15 days	As for 22 days	1 ,, ,, North Sea 8 ,, ,, Bear Island 8 ,, ,, Iceland
(E) Manufactured open pan	0·4	No browning	No browning	No browning	No browning	1 ,, ,, North Sea 8 ,, ,, Bear Island 8 ,, ,, Iceland
(F) Solar (3)	0·76	No browning Traces Traces one fish only	Slight browning Marked browning	Marked browning	Marked browning	1 ,, ,, North Sea 8 ,, ,, Bear Island 8 ,, ,, Iceland
(G) Solar (4)	0·1	No browning	No browning	No browning	No browning	1 ,, ,, North Sea 8 ,, ,, Bear Island 8 ,, ,, Iceland
(H) Pure (A.R.)	0·1	No browning	No browning	No browning	No browning	1 ,, ,, North Sea 8 ,, ,, Bear Island 8 ,, ,, Iceland
		14 days in salt	*19 days in salt*	*20 days in salt*	*25 days in salt*	*27 days in salt*	*32 days in salt*	
(I) Manufactured vacuum (A)	2·7	Marked browning	Browning	Marked browning	Marked browning	Marked browning	Marked browning	9 day iced North Sea 9 ,, ,, Bear Island 9 ,, ,, Iceland
(J) Manufactured vacuum (B)	0·1	No browning	No browning	No browning	No browning	No browning	No browning	9 ,, ,, North Sea 9 ,, ,, Bear Island 9 ,, ,, Iceland
(K) Solar (2)	0·2	No browning	No browning	No browning	No browning	No browning	No browning	9 ,, ,, North Sea 9 ,, ,, Bear Island 9 ,, ,, Iceland
(L) Manufactured open pan	0·3	No browning	No browning	No browning	No browning	No browning	No browning	9 ,, ,, North Sea 9 ,, ,, Bear Island 9 ,, ,, Iceland

—• Not examined.

browning described below. Some experiments with salts, to which traces of bromide and iodine had been added were inconclusive; and it was at this stage that the project had to be temporarily suspended.

Icelandic research

Early last year interest in the problem was revived by two conflicting reports from Iceland concerning browning. The first[4] sought to show that browning was caused by halophilic bacteria that required calcium for their growth; the other, a private communication, now published,[1] claims that browning can be caused by very small traces of copper in the curing salts. At the request of the Icelandic scientists further work was initiated at Torry Research Station to test the validity of these claims.

As the result of several experiments the conclusion has been reached that traces of copper in the curing salts can definitely cause marked superficial browning during the "wet stack" stage of the salting of white fish.

The Icelandic workers found that by fractional crystallisation of the salts, which caused browning, only the most soluble portion contained the browning factor. This was borne out in practice where salters, who washed their salt before using it, found no browning in their cures. It was also found that by incorporating metallic salts (such as iron, cobalt, copper, zinc, manganese) into the curing salts, only copper, even in minute traces, produced marked discoloration of the fish. Iron salts did produce some discoloration after a lengthy period, but the amount required to obtain this result was far in excess of the amount normally present in the curing salts.

Using a variety of salts, solar, mined and manufactured, containing copper in amounts ranging from 0·0 to 3·0 p.p.m., the Icelandic workers found mild discoloration was produced after three months with 0·1 p.p.m. and after five weeks with 0·2 p.p.m. With salts containing 0·3 and 0·4 p.p.m., fish showed traces of browning after 14 days and were much discoloured after eight weeks; at the 1·1 p.p.m. level, traces of browning occurred after 10 days and after eight weeks or less, the surfaces of most fish had a dark brown colour. At the 3·0 p.p.m. level, traces of discoloration appeared after three days and was very marked after 14 days.

Rôle of copper in browning

Our own experiments have also shown a correlation between the degree of browning and the copper content of the salt (see Table 2); the copper now being estimated by the sensitive dithio-carbamate micro method.[5] Moreover, we found that the surfaces of the browned fish always contained more copper than those of the normal fish with no discoloration. (See Table 3.) Further, the addition of traces of copper to the curing salts, that did not produce browning invariably caused discoloration (see Fig. 1). In general, however, our experiments indicate considerably less sensitivity to copper at the lower levels than do Icelandic results. Thus, only at concentrations above 0·4 p.p.m. Cu has marked browning been produced within the storage periods of 8 to 12 weeks. This dis-

crepancy may well be due to the variation in the nature of the fish, because even cod caught at the same time on the same ground show differences in the speed and degree of browning. Moreover, as mentioned earlier, some comparative work has shown that North Sea fish in general do not brown as readily as fish from Iceland and Bear Island, and this applies irrespective of the freshness of the fish before salting (0-29 days in ice). Naturally, experience at Torry Research Station with both Iceland and Bear Island fish has been limited, and it may well be that in general, fish from both these areas become brown more readily at the lower copper levels. However, the discrepancy may also be partly explained by difference in temperatures of storage, for it has been found that browning can be somewhat delayed at temperatures of 5°C. and below, and storage temperatures at Torry Research Station (usually about 8-10°C.) might well have been lower than those used experimentally in Iceland.

Table 2 shows marked differences in the copper contents of the salts. In the solar salts examined the figures range from 0·1 to 0·76 p.p.m. and in manufactured salts from less than 0·1 to 3·8 p.p.m. The manufacturers of salts (D), (E), (I), (J) and (L) state that in salts (D) and (I) which were vacuum produced, the corrosion of copper evaporator tubes used at one stage of the process is almost certainly responsible for raising the copper content of the salt; and that this defect has now been substantially rectified. Salt (J) produced in a plant equipped with nickel tubes has a very low copper content, and in the few experiments reported here produced no browning in North Sea, Bear Island or Icelandic cod after 50 days storage at 10-12°C. (see Table 2).

With regard to bacterial theory of browning it was found that sterilisation of salts which produced discoloration had no effect upon the onset or intensity of the browning. In fact, fish which had been sterilised by autoclaving (10 lb. pressure for 10 min.) still showed marked browning with salts (sterilised at 20 lb. pressure for 30 min.) containing the higher levels of copper (0·4 to 3·8 p.p.m.) and no browning with sterilised salts containing no copper (less than 0·1 p.p.m.). It is concluded, therefore, that browning is not due to the activity of micro-organisms.

No complete account can yet be given of the rôle copper plays in the browning process. It is known that other fish products can go brown, *e.g.*, during canning and dehydration, and it seems highly probable that a chemical reaction of the Maillard type is responsible, and that this reaction is catalysed by copper.[6] The precise nature of the reaction and the constitution of the brown colour are subjects for further research.

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All the analytical data recorded above were obtained by Mr. K. Avery of Torry Research Station, who was also responsible for devising and carrying out most of the experiments described.

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Table 3. Copper Content of the Surface Flesh (to about ¼ cm. depth) of Normal and Discoloured Salt Fish after 32 Days in Salt at + 12 to 15°C.

Salt used	*Copper content of salt in p.p.m.*	*Copper content of flesh of fish salted: in p.p.m.*			*Appearance salted fish*
		Bear Island cod	*Iceland cod*	*North Sea cod*	
(1) Manufactured vacuum salt ..	3·8	*12·4	*12·0	*0·5	All fish dark red-brown
(2) Manufactured open pan	0·4	*4·5	*4·2	*4·0	No browning
(3) Solar (2)	0·2	*4·2	*4·5	*4·1	No browning
(4) Solar (3)	0·76	†5·3	†5·0	†5·2	Browning on all fish

* Average of 36 samples.
† Average of 18 samples.

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Booklets Received

★A folder containing technical leaflets (Nos. 1-7), describing the physical properties and chemical analysis of the various grades of precipitated calcium carbonate (P.C.C.) produced by John and E. Sturge Ltd., has been published. Copies are available on application to the company.

★The directory "British Food Machinery" published by the Food Machinery Association is to be replaced with a series of sectional directories. The first, "British Dairy Equipment" (88 pp.), has now appeared. First there is a directory of member firms. Next comes the illustrated section where members' advertisements appear in alphabetical order. Finally there is an index of products and services and an index of equipment. There are four flow sheets of various dairy plants, the equipment being keyed to the final index.

★A notable departure from orthodox pump impeller design is said to be the secret of the *Cedelcor Egger* patent centrifugal pump, which is described in a booklet published by the Cellulose Development Corporation Ltd. As a result of this new design, the following advantages are claimed for the pump, which is made in this country by arrangement with the Swiss inventor: it will pump evenly, although air, gas or foam may be present; it will not air-lock, is self-regulating and self-priming; it will deal easily with consistencies; it is specially suitable for viscous liquid; it is unchokeable for all practical purposes and it is at least as efficient as conventional pumps on clear water.

Diagrams of the impeller design and explanations of the pump's action are given. Specifications and typical performance curves are also included in the booklet.

Choosing Detergents for Cleaning Jobs in Food Factories

By J. C. L. Resuggan, F.R.I.C.

(Director and Chief Chemist, The British Hydrological Corporation)

There are at least eight factors which influence the choice of detergents for cleaning jobs in food factories. The type of deposit to be removed and the chemical nature of the surface to be cleaned are two of the more important. Method of application, time available for cleaning, quality of water, availability of heat and the nature of machine washing operations are other considerations. All these points are discussed in turn by the author to help food manufacturers choose the right detergents for their own special needs.

IN every food factory, whether it is concerned with jam manufacture, the production of sausages, margarine or canned meats, numerous cleaning problems are to be found. These must be dealt with in the most thorough fashion as they are of the first importance in the manufacture of food products of high hygienic quality.

The amount of time and labour which is expended every day in cleaning operations in such establishments is very considerable, and the total cost in labour for such operations amounts to a large sum every year. In spite of the rather obvious fact that so much money must be spent in time and labour, relatively little thought is given to the correct choice of detergents which, if properly selected, can reduce the wastage of time and labour by a large margin and, at the same time, enable the cleaning operation to be carried out with greater efficiency.

So long as essential cleaning operations are regarded as a kind of necessary evil to which the minimum technical attention must be paid, so long will the cost remain at a high level. In order to achieve the saving of money and labour, the detergent or detergents must be chosen scientifically and with special reference to the conditions under which they will be used.

There are a number of factors which have to be considered when choosing a detergent, and it may be useful to enumerate them as follows:

1. The type of deposit which is to be removed.
2. The chemical nature of the surface and sometimes the physical condition of the surface from which the soil must be removed.
3. The mode of application of the detergent solution and the degree to which hand cleaning is essential in the process.
4. The length of time which can be permitted for efficient detergent application.
5. The type and quality of the water to be used.
6. The nature of any machine washing operations which may be included in the general cleaning process.
7. The availability of heat to maintain the highest efficiency in the detergent solution.
8. The final bacteriological condition essential for that particular food processing operation.

Proper attention to these factors requires careful consideration and study. In the first instance, a food factory may have a considerable variety of plant which may vary not only in size and shape, but in the materials of which it is made. The tendency is to reduce the whole cleaning process to a lowest common denominator as far as detergent is concerned, irrespective of whether the one detergent will carry out all the cleaning tasks equally well. It is useful, therefore, to discuss the points enumerated above in more detail. Obviously it is not possible in a short article to discuss all the possible types of contaminating material in food plant, but one or two cases will be quoted to demonstrate the point we wish to make.

Nature of the soil

Firstly, the nature of the soil. This may involve animal fats, proteins, vegetable oils and fats, cellulose, starch and residues of an acidic nature as well as miscellaneous debris, dust and soil from root vegetables, etc. Obviously, the deposits may be mixtures of two or more of these general classes. The condition of the material is also important. Dry and hard deposits which have been baked on during a heating process and soft and moist conditions are the two predominating conditions. The heaviness of the deposit has an important bearing on the detergent and method used.

The degree to which fats predominate will normally be known. If a high percentage of animal fat is present, then the detergent should contain, if the other factors permit it, a reasonably high proportion of caustic alkalinity in order to saponify at least some of the fat. Saponification of part of the fatty material will provide soap in the detergent solution which will increase the penetrating and emulsifying power of the solution. In such a case the solution must be used hot as it is necessary for the fat to be liquefied for the maximum saponification to be obtained. Such a detergent might not require the presence of any organic wetting agents, since the saponification process will provide this itself.

Vegetable oils are somewhat different. The cleaning of plant used for the production of salad cream, etc., does not call for such drastic treatment. While a proportion of saponification is, perhaps, desirable, good cleaning can

usually be obtained with a much lower alkalinity of detergent by adding a wetting agent. Certain types of deposit may first have to be softened by means of a warm water soak before applying a hot alkaline solution, as there is a danger of a hardening process being effected if the warm water treatment is omitted, which will make a cleaning operation much more difficult.

Obviously, hot alkaline solutions are not for manual application, or rather are not to be employed where the hands of workers will come into contact with them. Also, the question of rinsing the plant afterwards must not be forgotten. Highly alkaline solutions such as are involved when a preparation of free caustic soda is present must be strengthened by the addition of substances which will facilitate quick and complete rinsing.

Surfaces of plant

Consideration of the composition of the surface from which the soil must be removed involves a wide range of materials, mainly, stainless steel, tinned steel, tinned copper, sometimes copper itself, gun metal, galvanising, vitreous enamel, aluminium, glass and plastic. Perhaps the best way to approach a cleaning problem is to determine the best kind of detergent to remove the soil and then to consider the chemical composition of the detergent in relation to the surface to be cleaned. Stainless steel is, of course, the best, because every kind of detergent can be used without harming it. Tinned steel, however, must be watched carefully, because of the danger of alkaline materials attacking the tin. Detergents for tinned surfaces have been in use for a long time, and effective inhibition can be obtained either by the use of sodium sulphite or by using a detergent based on silicates.

Alkaline detergents containing a high proportion of silicate and excluding free caustic soda are usually satisfactory for galvanised surfaces, but here there is a limiting factor of temperature. Boiling point should not be approached or blackening will result. Copper and gun metal, while not seriously damaged by solutions of high alkalinity, do tend to discolour. However, these two materials are not by any means in general use and are more usually found in plant which handles crude foodstuffs, which themselves have to be cleaned and prepared for subsequent processing.

Aluminium is widely used for food plant, and here, it is particularly important to avoid strong alkalies. Mild alkalies with silicates are usually satisfactory, but once again high temperatures must be avoided.

Glass pipe lines are often met where liquid food processing is encountered. This is a case where circulation of quite strongly alkaline solutions is permissible. Low alkalinity solutions which contain a high proportion of silicate should be avoided, as etching of the glass may well occur. Vitreous enamelled surfaces must also be protected against silicates, as there is a tendency for them to etch unless the silicates are balanced carefully in the detergent and the person formulating the product is aware that it is for use on vitreous surfaces.

Plastic is only a general name, and not all the synthetic resins react in the same way to the different materials. Some are quite resistant even to highly alkaline solutions, while others appear to suffer considerably. As a general rule, plastic equipment does not come under the same heading as the type of plant wherein strongly alkaline solutions are used, and are much more the subject for hand cleaning operations.

For all the surfaces mentioned above, detergents incorporating organic anionic wetting agents are permissible, and in many cases highly desirable.

Application of detergents

The method of application is important. The main question is whether soaking or circulation of a solution can be employed or whether the detergent must be assisted by manual cleaning with brushes, swabs, etc. Where manual cleaning is to be carried out, highly alkaline solutions must be avoided, and detergents of low alkalinity with a good wetting agent content must be employed. Certain wetting agents of the non-ionic class have recently found favour as unassisted detergents, and these seem to be ideal for the manual cleaning operations. Some of these substances have a very high power of emulsification and suspension, while at the same time being entirely neutral in reaction, thus eliminating one of the factors which can irritate the skin of the operator, although it must be mentioned that even so, the odd case of someone whose skin is susceptible even to absolutely neutral wetting agent solutions will be found from time to time. Such cases are rare, however, and more often involve women than men.

Any scouring operation involving abrasives should be considered in the light of the surface involved and the bacteriological condition desired. Scratches can help to make a surface more difficult to sterilise. Whether this point is important or not will depend on the mode of sterilisation employed. Chemical sterilisation is always rendered more difficult by a scored or scratched surface.

The length of time necessary for cleaning depends on the concentration of detergent and power. Where plant and equipment can be soaked for long periods, lower concentrations can often be used. Temperature is also important, and perhaps this factor may be considered to be more flexible than the others.

Water

The type of water used for cleaning is important. If it is a well water supplying a factory it may be very hard, and consequently will cause additional trouble both because of its effect on the deposit and of its ability to use up part of any alkaline material in getting itself softened. With some hot solutions there may be a tendency for the deposition of calcium or magnesium salts which, after the final cleaning process,

will reveal themselves as a white film impossible to rinse away. Therefore, detergents should be graded with the water quality in mind, and the presence of hardness salts combated by the addition of polyphosphates. The bacteriological condition of any waters not obtained from the public water supply should be watched carefully. Well water used for the final rinsing of equipment has been known to cause serious infection in foods subsequently processed in it when the temperature of operation was insufficient to effect pasteurisation. Many factories prefer to use water from their own wells for the sake of economy, but fluctuations in the bacteriological condition of such well waters is only too well known.

Machine washing of the exteriors of filled food containers to remove residues of fat, fish, oil, etc., is quite common. The finish of the containers (glass, metal, etc.) and the type of machine (soaking or spraying) will influence the choice of detergent. Sometimes hot water alone is sufficient, but consideration must be given to whether it contains any scale preventive or slime inhibiting substances. Lubrication of the moving parts in the washing and rinsing sections of machines is another matter.

The final bacteriological condition of plant and equipment can either be regarded as a matter for a separate sterilisation procedure where, for example, it is necessary to achieve almost complete sterility, or it can be a question of incorporating into the detergent a sufficient quantity of chemical sterilising material to enable the cleaning operation actually to be a cleaning and semi-sterilising procedure. Obviously, in the presence of organic matter no chemical sterilising agent can do a perfect job, but it can very often reduce the bacterial count on the cleaned surface to something like 1% of what it would have been if the chemical steriliser had been omitted. Hypochlorite solutions and quaternary ammonium compounds are commonly used for this purpose, but with the former the possibility of corrosion on some surfaces must be borne in mind. Hot solutions of quaternary ammonium compounds are often useful for dealing with spore forming organisms where the spores are not easily destroyed either by heat or by chemical action alone; the combination of heat and the quaternary solution has often solved quite difficult problems with such spores.

Types of detergent

It can thus be seen that the considerations in choosing the right detergent are really quite important if the best result and most rapid action is to be obtained. The following chemical entities are used in compounded detergents for food plant. In certain circumstances some of them can be used by themselves, but mainly mixtures are employed to get the best results:

Group A. Strongly alkaline substances. Caustic soda, sodium orthosilicate, sodium metasilicate, trisodium phosphate.

Group B. Substances of moderate alkalinity. Siliceous silicates (*e.g.* water glass and related liquids), sodium carbonate, sodium sesquicarbonate, disodium-mono-hydrogen phosphate, sodium tripolyphosphate, soaps.

Group C. Substances which in solution give the near neutral reaction. Sodium hexametaphosphate, sodium chloride, sodium sulphate, sodium sulphite, sodium alkyl sulphates, sodium aryl-alkyl sulphonates, ethylene oxide condensation products with fat alcohols, etc., surface active quaternary ammonium compounds.

Canned Food Production Double Pre-War Level

WORLD output of the main varieties of canned food has increased to about twice the pre-war level and its value—at perhaps £1,500 million—is more than seven times as great. These striking facts are disclosed in a review of world canned food production and consumption issued by the Commonwealth Economic Committee.*

Although the United States continues to provide more than two-thirds of the world total, the commonwealth is responsible for nearly half the remainder. On the whole, a relatively small proportion of output enters international trade for, although Australia, South Africa and some other countries export the greater part of their packs, food has always been canned mainly for consumption in the country of production.

The largest importer is the United Kingdom, followed by the United States and Canada: in the aggregate these three countries take about half the total world exports. Changes in the trade situation include a decline in the United Kingdom share of world imports and a rise in the relative importance of some Asian countries.

Production trends. Nearly twice as much canned food is produced as before the war and about half the increase has taken place since 1948. Canned meat output has risen steeply to become, next to vegetables, the most valuable item and now includes a higher proportion of "hot packs" (stews, puddings etc.). On the other hand, the loss by Japan to the U.S.S.R. of the Siberian fishing grounds has offset part of the increase in the output of other countries' fish canneries. Moreover, the world total includes far less salmon that it did in pre-war years. The most striking advance has been in canned fruit juice production which has reached six times the pre-war level.

Consumption. Many countries, particularly in Asia and Africa, have increased their consumption of canned milk and, to a lesser extent, canned meat and

(*Concluded on page* 208)

* *Canned Food.* Price 5s. net (5s. 4d. post free), obtainable from H.M.S.O.

Advances in Food Technology

CITRUS JUICES

Colour Measurement

Colour differences in fresh and processed citrus juices and concentrates occur because of such factors as fruit variety, pulp content, and storage. Although these colour differences can be objectively measured with the Hunter Colour Difference Meter, neither this nor any other instrument now available is satisfactory for determining objectively the actual visual colour of a citrus juice as seen by an observer.

The Hunter Colour Difference Meter can be used to investigate changes that take place in processed citrus products during processing and storage. It is also useful for measuring colour variations in commercial products to provide data which may be used as the basis for establishing future quality standards.—R. L. Huggart and F. W. Wenzel, *Food Tech.*, 1955, **9** (1), 27.

PALM OIL

Carotene Extraction

Since all the known methods of extracting carotene from palm oil have certain drawbacks, research scientists at the *Institut de Recherches pour les Huiles et Oléagineux* have tried to develop a new method based on the use of alcoholysis but without certain drawbacks of stereoisomerisation otherwise encountered during the distillation. For this purpose, it is necessary to lower the distillation temperature and to minimise the heating time of the carotenoids. This can be done by using an apparatus designed for molecular distillation, preferably of the centrifugal type, with high vacuum. The palm oil is separated, *e.g.* by crystallisation at 19°C., into a liquid and a solid fraction. The esters containing the carotenoids are obtained by alcoholysis, cleaned, dried in a low temperature vacuum, and then submitted to molecular high-vacuum distillation at a temperature of 80-100°C. The concentrate thus obtained contains over 95% of the carotene originally contained in the palm oil. The method is now being developed on a semi-industrial scale. —M. Servant and Mlle. Argoud, *Oléagineux*, Jan., 1955.

MILK

Addition of Vitamin D

Milk can be enriched with vitamin D either by ultraviolet irradiation or by the direct addition of concentrated solutions of the pure vitamin. While tests over some years have not conclusively pointed to any marked superiority of one method over the other, the advent of a new vitamin mixture may shift the balance in favour of direct addition. It is a vitamin powder bound to milk albumen which, when added to the milk, enriches the latter in vitamin D without adding any alien matter. A further advantage of this German product (*Vilakmin*, made by Chemische Werke Albert, Wiesbaden) is that it permits rapid, strictly controllable and completely uniform distribution of the vitamin in the milk.—W. Wodsak, *Fette, Seifen, Anstrichmittel*, 1954, **56**, 1003.

EGGS

U.V. Detection of Washed Eggs

A method of detecting washed eggs by examination under ultraviolet radiation has been investigated by workers at the University of California. Two field trials using this method have been conducted and it would appear that accuracies of 80-100% can be achieved with this method.—Hixon and Stewart, *Food Tech.*, 1955, **9** (2), 67-69.

MEAT PROCESSING

Factory Disinfection with U.V. Light

A large-scale test, carried out in a meat products factory by the German Export Meat Control Station, Hamburg (which is under the direction of the Federal Meat Research Institute), indicates that a direct ultraviolet irradiation can effectively supplement, though not entirely supersede, the normal disinfection measures. The test consisted in a regular check, during five weeks, of the germ level on Fridays and Mondays, *i.e.* before and after the weekend disinfection. One of the two rooms thus tested was subjected to regular ultraviolet radiation, the other one not. On Mondays, the germ level in the first room was found to be considerably lower than in the second. On Fridays, however, the difference had considerably narrowed, in spite of the continued irradiation. The incidental purpose of the test was to prove the value of a regular bacteriological control in food processing premises. — Dr. G. Dutschke, *Die Fleischwirtschaft*, 1955, **7**, 62.

FISH OIL

Nutritional Status of Unsaponifiable Fraction

Glycerides of marine oils differ from fatty food raw materials of terrestrial origin mainly because of the presence of considerable proportions of polyethylene fatty acids of a particular molecular structure. This is probably the reason for certain physiological effects investigated by the French Fisheries Research Institute. In contrast to most domestic animals, human beings can consume comparatively large quantities of fish oil with impunity. In animals, excessive consumption of fish or whale oil causes a deficiency in vitamin E which may become fatal. The phenomena can be ex-

plained by distinguishing between the unsaponifiable fraction which is rich in vitamins (especially A and D) and is of undoubted nutritional value, and the saponifiable fraction which may be harmful. It is therefore desirable to make the most of those oils with high vitamin contents, especially the hydrogenated oils which are of high nutritional value to human beings.—P. Creac'H, *Oléagineux*, 1955, **10**, 161.

APPLE WINE

Enzyme Stabiliser

An enzyme preparation of glucose oxidase and catalase has been used to stabilise apple wine by the removal of oxygen and possibly by reducing the growth of acetic acid bacteria. The treated wine was unpasteurised and unsulphured with a *p*H of 3·6 and an alcohol concentration of 12% by volume. Stability was measured by the development of volatile acid. It was found that the development of volatile acids in the wine was retarded with an enzyme content of 0·10%; further development was stopped by a content of 0·15%. No objectionable flavours were observed, and discoloration was so slight that it showed no appreciable difference from the natural browning of the untreated wine.—H. Y. Yang, *Food Res.*, 1955, **20** (1), 42.

SUGAR

Colorimetric Control of Traces of Invert Sugar

Sugar refining has reached such a degree of perfection that the accurate control of the necessary minute admixtures, *e.g.* of invert sugar, calls for highly sensitive analytical methods. For this purpose, a semi-micro colorimetric method suggested by R. Caputto, L. F. Leloir and R. E. Trucco for the quantitative control of monoses in the presence of disaccharide reducers, has been adopted and adapted by the Central Laboratories of the Belgian Ministry for Economic Affairs. The method is stated to be easy to apply and particularly suitable for serial tests. Owing to the neutrality of the cupric solution used and the relatively low heating temperature, the saccharose is perfectly preserved. — J. Bernaerts, *La Sucrerie Belge*, 1954 (7 and 8).

MEAT PRODUCTS

Electric Currents and Keeping Quality

It is known that changes in the composition of meat products are somehow related to the presence of minute electric currents, which are only just measureable. But the true importance of these electric currents is still obscured by the fact that the intensity of the currents grows with the admixture of soluble salts. Defects in meat products conventionally ascribed to deficiency in salt content may therefore be due to a deficiency in electric current intensity. It is desirable to investigate the true effect of the electric currents on the keeping quality of meat.—W. v. Suntum, *Die Fleischwirtschaft*, 1955, **7**, 123.

CANNED VEGETABLES

Addition of Iodised Salt

No detectable deterioration in quality due to use of iodised salt in canned tomato juice, bulk and canned sauerkraut, canned green beans, canned whole kernel yellow corn, and bottled pickled olives was found by workers at the Ohio State University.

Since the products tested were representative of processed fruits and vegetables which contained considerable amounts of salt, it may be concluded that as far as processed fruits and vegetables are concerned, there will be no fear of deterioration of the quality of products due to the use of iodised salt instead of plain salt.

Therefore, it would seem wise to use iodised salt in processing vegetables and fruits to reduce the incidence of goitre. It might even be wise to state on the label that iodised salt had been added as an additional safeguard to health.—Kojimer and Brown, *Food Tech.*, 1955, **9** (2), 103.

Canned Food

(*Concluded from page 206*)

fish in recent years—notably Malaya, India and Ceylon among Commonwealth countries. The detailed consumption statistics which are available for the United Kingdom, Canada, Australia and the United States show that in nearly all categories canned food has come to form a larger proportion of total food consumption than before the war. The most notable exception was canned milk in the United Kingdom where the consumption of liquid milk has been very greatly increased.

Trade. The volume of world trade in canned food in recent years has been nearly half as large again as before the war while the value has increased from about £45 million to nearly £300 million. There have been important changes in the shares furnished by the principal exporters; Argentina has ceased to be the largest exporter of canned meat, first place having been taken by Australia which has also become the main exporter of canned fruit. South Africa has become a prominent canned fruit exporter and, although Malayan supplies have not regained their pre-war volume, the Commonwealth share of the canned fruit trade has risen from less than a third to nearly half the total. On the import side, the United Kingdom, taking nearly 30% of world exports, remains by far the largest market but receives less than before the war whereas imports by the United States, Canada, and, at lower levels, numerous other countries have risen considerably. The Commonwealth provides around 20% of world exports of canned food, a share that is markedly larger than before the war and, in spite of that country's enormous production, somewhat higher than that of the United States.

In addition to considering in some detail the main types of canned food—meat, fish, milk, fruit, fruit juices and vegetables—the review includes notes on a number of minor items such as canned sausages and soups.

Machinery and Equipment

Speed variators for food machinery

Infinitely variable speed gears are of special importance for food and packaging machinery. An ingenious speed variator is produced by Allspeeds Ltd., who will be showing their range at the B.I.F., Castle Bromwich (Stand D.257) from May 2-13. Units up to 50 b.h.p. will be shown and a miniature of only $\frac{1}{30}$ b.h.p. will be on public view for the first time.

The units were invented by a Swiss, Jean E. Kopp. The Kopp variator works on the principle of hardened steel balls movable around their axis and on which two cones impinge with regulated pressure. When the cones are acting on the same diameters of the balls, but on opposite sides, the input and output shafts run at equal speeds. If the balls are turned on their axis, however, one cone will be operating on a very reduced diameter and the other on a large diameter. When these axes are at their extremes a ratio of 3:1 in each direction is obtained, so there is a 9:1 overall infinitely variable variation in output speed from the same input speed.

The manufacture of the balls is a very specialised job. They are made from electrically melted EN.31 and hardened to Rockwell 63°. Making steel balls is, of course, no problem with modern equipment, but to make them with a hole through and to keep them within a tolerance of 0·00015 in. calls for high concentration and skill on the part of the operators. This is the standard that must be maintained to ensure perfection of speed control. As a result of this specialised manufacture, never previously undertaken on a commercial scale, Allspeeds Ltd. are exporting these balls to six countries, including the U.S.A., where variators are in production.

The variator casting, which is supplied by the Butterley Co. Ltd. in a special grade of Meehanite, comprises two end covers, a body and an iris plate.

■

Improved electric motors

Brook Motors Ltd. will be featuring their range of electric motors to British Standard 2083:1954, at the B.I.F. in Castle Bromwich. The fan cooled types are produced in frame sizes from B.183E to B.365. As an alternative, the company offer an open drip proof machine at the same outputs and dimensions (frame sizes 203 to 326). The B.S. ranges will eventually replace all other older types of motor design produced by Brook, the advantages of interchangeability on physical dimensions, particularly with motors for export to the U.S. or for mounting on American machines, being apparent. (Although frames are identical, correspondingly higher outputs are obtained on the 60 cycles supply.)

British Standard fan-cooled electric motor, one of a range to be exhibited by Brook Motors Ltd., at the B.I.F.

New enclosures have been designed for larger motors from 75 to 500 h.p. in the drip proof type and 40 to 175 h.p. in the totally enclosed fan cooled type. Special features are the loose louvres on the ventilation ports which can be rotated through 90°, affording protection on the drip proof design on any mounting position; and the advance method of internal and external ventilation which gives increased ratings on fan cooled motors. Cartridge type bearings enable the motor to be dismantled without disturbing them.

Both enclosures may be supplied as cage or slip ring types. Easily accessible slip rings are fitted; brush lifting and short circuiting gear with electrical interlock are included as standard.

A selection of fractional h.p. motors in a variety of enclosures and types will be available, together with control gear for automatic push button or hand operation.

Miniature speed variator of only $\frac{1}{30}$ B.H.P. Larger versions range up to 50 B.H.P.

■

Valve and pump developments

Saunders diaphragm valves, typical of the millions in use throughout the world for fluids as simple as air and water, as delicate as foodstuffs and as difficult as abrasives and corrosives, will be shown in their great variety on Stand No. D.125 at the B.I.F., Castle Bromwich (May 2-13).

This year the emphasis will be on remote control as applied to Saunders diaphragm valves. An 8 in. direct electrically operated valve will be demonstrated. The actuators provide positive opening and closing and, when necessary, can be operated in any intermediate position. At the present time, this form of operation can only be offered in sizes 8 in. and upwards and, as with all Saunders valve mechanisms, any equivalent size standard "A" type body can be utilised, dependent upon the fluid in the line.

The whole arrangement is of very compact design and completely self-contained. It is anticipated that other sizes will become available with this form of operation over the next few months.

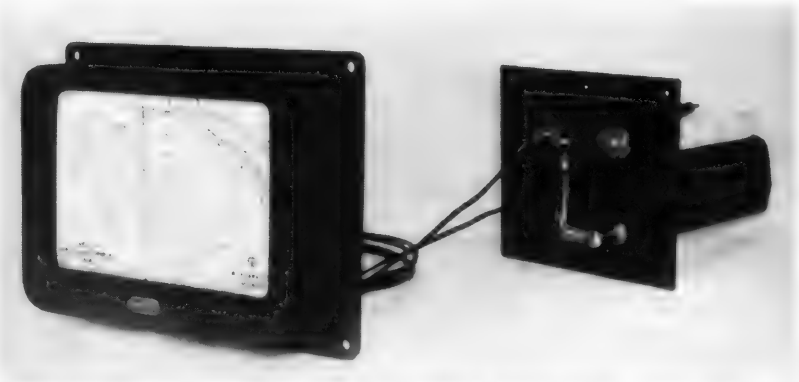
Examples of the new H.S.B. with body, bonnet and handwheel of uniform specification, will be shown. The new series is of five sizes: $\frac{1}{4}$ in., $\frac{3}{4}$ in., 1 in., $1\frac{1}{4}$ in. and 2 in. in both screwed and flanged type. With H.S.B. body, bonnet and handwheel, it is claimed to fulfil the need of laboratories and factories where a completely non-corrodible valve is essential. As with all Saunders diaphragm valves, the three simple units, body, bonnet assembly and diaphragm are interchangeable with units of different specification so that where internal protection

Saunders diaphragm valve showing how new diaphragms can be fitted or exchanged. The mechanism is at all times isolated from the fluid.

is adequate for the service, the less expensive cast iron bonnet and handwheel can be fitted. Alternatively, where a glass rubber or lead-lined valve with non-corrodible bonnet assembly is preferred, this combination can now be supplied from stock parts.

Also on show will be Saunders' range of *Safran* centrifugal pumps, in eight sizes, from ⅜ in./1 in. to 5 in./6 in., which is now extended by many adaptations for special purposes and by the introduction of a series of multi-stage and vertical trunk pump models. The multi-stage pump is represented by a 1½/2 in. model to bare shaft only of four-stage arrangement, incorporating a new Saunders patent for self priming. The impellers are of contra-flow type, whereby the thrust load of two stages is hydraulically balanced. (In even stage models, complete hydraulic balance is provided by the pairing of impellers, thus eliminating the need for any special balancing devices.) Other features are: One gland only, which is placed on the low pressure side, thus obviating any trouble with high pressure glands. Simplicity of maintenance—the pump's internal parts can be dismantled without breaking pipelines. Stable characteristics throughout the head/volume range, adapting the pump admirably for parallel working and boiler feed applications.

Also on show will be the CCE *Fullway* hot water circulator made in sizes 1½ in., 2 in. and 3 in., and a special version of self priming pump for vertical mounting. This model is more especially produced for handling chemicals on a section lift and is thus often made in all stainless steel, but can be manufactured in other materials.



Bimetallic psychrograph for recording humidity at temperatures above 160 F.

Humidity recorders

The German instrument manufacturers, Wilhelm Lambrecht of Goettingen, have appointed Opancol Ltd., London, W.1, as their sole agents in the U.K. Among the Lambrecht instruments of interest to food manufacturers are their range of bimetallic psychrographs for recording humidity, particularly at temperatures above the limit of 160° F. These instruments essentially consist of two thermograph systems, separate records being made on a dual chart. One bimetallic element is covered with a moistening sleeve, thus giving the "wet bulb" temperature. Graphical psychrometer tables accompany each psychrograph; by referring to these tables the percentage of relative humidity is determined from the wet and dry bulb recordings. Tables with figures for a determination of absolute humidity and dew point are available.

The bimetallic psychrograph is made of stainless materials. A special advantage of the Lambrecht instruments is that they are furnished with spring-loaded needle-bearings, which are insensitive to vibrations and to fluctuations of temperature, and which have a very low and constant friction.

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Vibrator feed weighers

The triple set of vibrator feed weighing machines with conveyors, manufactured by Autopack Ltd., have proved successful during the last two years in the weighing of sweets, pastilles, small biscuits, lump sugar, and powdered materials of many kinds. By the use of three weighers working in combination, an output speed of up to 60 weighings/min. is obtained accurate to within one item on every weighing or ½% on powders. Machines can be supplied to weigh all the normal range of weights up to 16 oz.

Cartons, already set-up, are fed by the conveyor to the weighing point, which is equipped with an electronic control to hold the weighing until the carton is in position and then to release it along the outlet conveyor for subsequent operations after the material has been discharged into the carton.

The whole unit has been designed for ease of cleaning and maintenance and adjustments or change of weights can be made in a matter of a few minutes.

*

Third speed control for Yale tractor

The Yale *Worksaver Tractor* can now be fitted with a third speed control which increases its speed range to more than 5 m.p.h. The outstanding features of this new tractor are its flexibility of operation and manœuvrability. The driver may ride or walk along in first and second speeds, the speed being controlled by finger-touch cams on the handlebar. He must, however, ride the tractor to engage the third speed. Depression of a spring-loaded button set in the footplate actuates third speed after a time delay. When the operator releases the button, the automatic control instantly reverts the drive unit to second speed. This method of third speed control ensures safe operation.

The compact size of the Yale tractor makes it suitable for restricted space conditions, and its comparatively light weight enables it to operate in areas where floor loads are limited.

The tractor has a maximum draw bar pull of more than 700 lb. It utilises two 6-cell, 11 or 13 plate batteries operated in parallel for first and second speeds and in series for third speed. The change from parallel to series operation is accomplished automatically by the contactor mechanism behind the battery compartment.

The *Worksaver Tractor* will be exhibited on the Yale and Towne Stand (D.305/204) at the B.I.F. this year.

Further information on the machinery and equipment described can be obtained by writing to the

Enquiry Bureau,
FOOD MANUFACTURE,
9 Eden Street,
London, N.W.1.

News Digest

What sells bread—slicing or wrapping?

IN THIS country 99% of wrapped bread is purchased not because it is wrapped but because it is sliced; in other words it is the convenience of having a loaf cut into slices which appeals to the British housewife. She is prepared to pay 1d. per loaf extra for this convenience, but not for extra cleanliness.

This was stated by Mr. W. Guise, of Messrs. E. S. and A. Robinson, when he addressed members of the South Western Area of the Institute of British Bakers at Bristol recently on "Packaging in the Bakery Trade."

The proportion of unsliced wrapped bread sold in this country was very small indeed, whereas in the United States all bread was wrapped whether sliced or unsliced. The American housewife had been educated to think of any loaf as a wrapped loaf for which she had to pay a certain amount. Her British sister thought of a sliced wrapped loaf as something for which she had to pay extra.

In America, of course, the bakers were handling far more varieties of bread than was normal in England. A transparent wrapper for bread added eye appeal, said the speaker, particularly to special varieties such as raisin bread, rye bread, etc. Ultimate purchase often depended on colour, appearance of crust or the number of raisins visible.

A trend which was being developed in America was a bakery pack containing sliced and filled buns. In this country, he thought, it might be possible to pre-pack such things as ham, cheese, tomato or meat rolls in this manner.

Quick freezing of bakery products was also gaining ground in the United States and it was predicted that within ten years 75% of the bread sold there would be frozen. However, bread was a very bulky product and would require a vast amount of additional low temperature storage space if it was to be handled in any volume.

The Americans had also achieved considerable success with their aluminium foil pan package. These packages were used to market a variety of bakery products which go from the retail store to the home refrigerator, thence to the oven and finally to the table without being removed from the original package. With increased refrigeration in private houses in this country, it was possible that this type of thing might develop here.

The pre-packaging of cakes and confectionery was becoming of vital importance to the bakery trade, for many of their goods were now sold "on impulse" at chain stores, self-service stores and grocers.

Food merged with Ag. ministry

The transfer of the functions of the Minister of Food to the Minister of Agriculture was approved in Parliament recently in spite of Labour opposition. Not all of the Food Minister's present duties will be taken over by the Ministry of Agriculture. The Minister of Health will soon be taking over those functions under the Food and Drugs Act (1954) connected with hygiene. The Minister of Agriculture will retain responsibility for enforcing regulations about the labelling of food and the prevention of fraud. Certain functions in Scotland now performed by the Minister of Food will be transferred to the Secretary of State for Scotland.

Record fruit juice imports

Fruit juice imports into the United Kingdom reached a record total of 10·5 million gal. last year, though in value the percentage increase over imports in 1953 was smaller. The figures are reported by the Commonwealth Economic Committee in *Fruit Intelligence*.

An additional million gal. came from the Commonwealth, mainly from South Africa, which replaced the British West Indies as the chief source. No purchases were made from Belgium and this helped to account for the reduced import from foreign countries.

There has been a marked rise in imports of non-citrus juices, especially during the last two years. In 1954, 4½ million gal. of these juices were imported, accounting for 43% of the total figure. This amount, nearly 3¾ times as high as the pre-war quantities, was largely because of heavy supplies of pineapple juice from South Africa and Australia.

Citrus juice imports were appreciably lighter than in 1948 and 1951, and only 2½ times the 1938 figure. The most marked change in this group of juices recently has been the decline since 1951 in entries of lemon juice and the sharp fall in purchases of canned orange concentrate, which last year reached only a third of the 1951 total. Large quantities of sweetened orange or grape fruit juices packed in cans for consumption as straight juice have been imported.

Anglo-Argentine trade agreement

All types of meat will be exported from the Argentine to Britain under the new Anglo-Argentine trade agreement signed in Buenos Aires recently. Britain will receive £34,960,000 worth of meat from the Argentine between now and June next year which will include chilled and frozen beef, frozen lamb, canned corned meat and pork. Other Argentine goods to be imported to Britain will include grain, butter, fruit and frozen poultry. The two Governments will do their best to reach a trade target totalling about £170 million.

It is estimated that Britain's export credit facilities will enable Argentina to place orders for £25 million worth of British capital goods. These will be bought on deferred payment terms.

Taxes could have stifled fish canning industry

Mr. Cyril W. Banks, managing director of British Fish Canners Ltd., addressed the Leeds Incorporated Chamber of Commerce, of which he is President, at their annual general meeting recently. Speaking of the effects of taxation on industry, Mr. Banks referred to his own experiences in introducing a new industry into this country over the last 40 years. He declared that had taxation for the first 25 years of that period been the same as during the last 15 years, the industry could not have survived.

Too much milk powder

The disposal of world surpluses in dried skim milk was studied by a Working Party set up by the Sub-Committee on Surplus Disposals of the Food and Agriculture Organisation. Demand for these surpluses is depressed by the fear that they will be thrown into the international market, so the Working Party has suggested that milk consumption should be increased by national promotional campaigns. The delegates concluded that some form of understanding between exporting countries on the disposal of surpluses and unused capacity is essential to trade development.

Bacon curers' new depot

M. Venner and Sons Ltd. (a member of the Denny Group), bacon curers and provision merchants, of Reading, have transferred their London depot from 112, Tooley Street to larger premises at 7/9, Fashion Street, E.1 (telephone Bishopsgate 0331/3).

Machinery firm's London office

Hansella Machinery and Packaging Ltd. have opened new offices at 44-46, Kingsway Chambers, Kingsway, London, W.C.2 (Telephone Chancery 2247). The sales agency of Bramigk and Co. Ltd. remains as before, at Mikro House, 15, Creechurch Lane, London, E.C.3.

Biscuit factory fire

Only about a quarter of the factory remains after a disastrous fire at the Thomas Parkinson's Ltd. biscuit factory in Preston. All four ovens—each costing between £25,000 to £30,000 to replace—and all the baking equipment has been completely destroyed. It is said that the value of the chocolate destroyed was in the region of £125,000.

Mr. P. H. Bailey, the managing director, informs FOOD MANUFACTURE that the company has been overwhelmed with offers of assistance from other biscuit manufacturers to produce biscuits to Parkinson's recipes. They hope to have six lines on the market to keep their name before the public until they are again in full production.

Cambridge Instrument's new division

The Cambridge Instrument Co., Ltd., have decided to establish at their new factory at North Finchley, London, a complete self-contained unit to deal with their increasing business in mercury-in-steel indicating and recording thermometers, vapour pressure dial thermometers, automatic temperature regulators employing these systems; and pressure and vacuum dial gauges and recorders.

This unit, which is termed the Mechanical Thermometer Division, is complete with its own sales, correspondence, manufacturing and repair sections, and will in future deal with all enquiries for the above mentioned instruments.

Correspondence relating to these instruments should now go to: Cambridge Instrument Co., Ltd., Mechanical Thermometer Division, Friern Park, N. Finchley, London, N.12. (Telephone, Hillside 5016; Telegrams, Fincamco, London, N.12.

Correspondence regarding all other types of Cambridge instruments should be directed, as hitherto, to the head office, at 13, Grosvenor Place, London, S.W.1.

OBITER DICTA

● Unless they are given food, the hungry millions will presently rise in world revolution. — *The Archbishop of York.*

● By whose culinary quirk has the fried egg become an ingredient of the mixed grill?—*Letter to "The Times."*

● The Rev. Sydney Smith confessed that his idea of heaven was eating *pâté de foie gras* to the sound of trumpets.—*"Shell" advertisement.*

● It is very good to see toothbrushes packed, but I am sure it would be better to see bread packed. — *Capt. Crookshank, Lord Privy Seal.*

● I have begun to brew beer instead of tea. It's simple—anyone could brew it—and even using the best malt and sugar it costs only 2s. 8d. *a gallon.*—*Letter to "Daily Express."*

● Soviet trade officials are good people to do business with—even though they do have inflated ideas of what Western greedy-gutses will pay for caviare.—*Cyril Ray in the "Sunday Times."*

● She manages to communicate, in her glistening, pasteurised way, the air of a lady, and this novelty is blinding enough in Hollywood to guarantee her the supreme accolade. — *Alistair Cooke.*

● Mr. Saggers senior has reached such a degree of skill in freehand drawing with a piping tube full of icing that he is leaving bakery and hopes to devote himself to art — preferably sugar rabbits, which are his speciality.—*Glasgow Herald.*

● We must try to revive sheep's head. It should be singed, and this used to be done by the blacksmith, and the reason why it was so tender was said to be that the blacksmith's boys played football with it. — *Miss F. Marian McNeill, author of "The Scots Kitchen."*

● In the composition of a sauce my grandfather attached great importance to what he called "the base." This base was a thin, tasteless paste of flour and some kind of oil, mixed with a spatula on a palette. While slapping and scraping, the old man would hum a Latvian hunting song under his breath.—*G. H. M. Nichols in "Punch."*

Glass Research Association

The British Glass Industry Research Association, which was registered as a Company last Autumn, is now to be separated from its parent body, the Department of Glass Technology at Sheffield University. Dr. R. G. Newton has been appointed Director and Mr. R. W. Douglas will occupy the Chair of Glass Technology at the University. The two organisations will continue to share the same buildings.

Both the University Teaching Department and the Research Association will run in close collaboration but their finances and administration will be entirely separate. The industry is to subscribe a minimum of £20,000 a year to the Research Association which will earn £10,000 a year grant from the D.S.I.R. while for every complete £100 over £20,000 from the industry the Government grant will be increased also by £100. Manufacturers will also continue to give financial support to the University Department.

Clifford Coupe's new offices

Clifford Coupe Ltd., sole U.K. agents for Aasted Chocolate Machine Co., Copenhagen, have moved to more spacious premises at Bridgeway House, Hammersmith Bridge Road, London, W.6 (telephone Riverside 8731).

Erections and Extensions

Schweppes, Ltd., plan to erect a laboratory at Garrick Road, London, N.W.9. They are also building a storage and distribution depot at Welton Road, Humberston, Grimsby, Lincs.

Beatties Biscuits, Ltd., plan to construct a new extension to Drumchapel Biscuit Factory, Great Western Road, Drumchapel, Glasgow.

The Nestlé Co. Ltd. are having extensions erected to their Carlisle factory.

Vitmealo (Ireland), Ltd., Victoria Quay, Cork, a newly formed company, have opened a factory at Clondulane, near Fermoy, Co. Cork, for the manufacture of meal concentrates for livestock foodstuffs.

The construction of a fish processing factory on a site at Galway Harbour, Co. Galway, Eire, is planned by the **Irish Sea Fisheries Association.**

Inverness Town Council Planning Committee has approved preliminary plans for the construction of a factory on a 3,000 sq. ft. site at Longman Industrial Estate for **Highland Sweets, Ltd.,** confectionery manufacturers, of Inverness.

APPOINTMENTS AND RETIREMENTS

Mr. D. M. Gill has been appointed technical representative of Sunvic Controls Ltd. in the North-West England Area for their process control division. Mr. F. N. Yates will be their technical representative in the same area for the scientific and industrial divisions. The same company announce that their representatives in the London and Home Counties Area will be Mr. W. F. Dorman for the scientific and industrial divisions and Mr. F. C. Chaventre for the process control division.

*

Dr. E. G. Woodroofe has been appointed head of the research division of Unilever in succession to Dr. H. J. Channon who has resigned. The director of Unilever Ltd. and Unilever N.V. responsible for research division and technical division will be Mr. J. A. Connel.

*

Mr. R. V. Wadsworth retired on April 1 from his position as chief chemist to Cadbury Bros. Ltd., in whose service he has spent nearly 41 years. He is remaining as a consultant. Before joining Cadburys in 1914 Mr. Wadsworth had experience as a chemist with Southall Brothers and Barclay and with the Dunlop Rubber Co. He was appointed chief chemist at Bournville in 1939 after the death of Mr. A. W. Knapp.

Mr. Wadsworth has been concerned largely at Bournville with maintaining the quality and purity of manufacture and with developing new processes and products.

*

Pollard Bearings Ltd. have appointed Mr. J. Price sales manager of the company. Mr. Price joined the company in July 1950 since when he has held the position of sales office manager and has been responsible for both home and overseas sales.

*

Mr. G. M. Wells and Mr. I. G. Hopkinson have been appointed directors of Hopkinsons Ltd. as from March 17, 1955. Mr. Wells joined the company in 1934 and has held the position of London manager since 1939; Mr. Hopkinson, who joined the company in 1938, has been works manager since 1947.

Obituary

Mr. Henry Risner, managing director of Tunnel Glucose Refineries Ltd., who died on March 12.

*

Mr. A. W. McNish, aged 80, chairman and managing director of Paine and Co. Ltd., brewers and millers, on February 19.

Mr. R. V. Wadsworth

Mr. J. Price

*

The sweets boom

The average Briton spends about twice as much on sweets as he does on bread, reported Mr. Heathcoat Amory, the Minister of Agriculture, to Parliament recently. Last year £297 million was spent on sweets, and during the past two years consumption per head has risen from just over 5½ oz. to 8¼ oz. a week. The average consumption before the war was only 7 oz.

The Minister sees the increase as a symbol of British prosperity, on the grounds that a nation which can afford to spend so much on sweets cannot find it difficult to pay for basic foods. He pointed out that the average consumer today eats more milk, meat and bacon than ever.

Robert Wilson's reorganisation

As part of a plan of internal reorganisation, Robert Wilson and Sons (Food Industries) Ltd. have transferred their food manufacturing and processing operations in Northern Ireland to a wholly owned subsidiary company, Robert Wilson and Sons (Ulster) Ltd. The change became effective on April 1. The ownership and management of the business remain unchanged.

Formation of Chelle Ltd.

Metal Closures Ltd., Great Britain, and M. Chelle and Ets. Chelle of France, have formed a new company, Chelle Ltd., through which all future sales and general marketing of Chelle machines in the U.K. and British Commonwealth will be effected. In addition, plans are in hand for the manufacture of these machines in this country.

The name "Chelle Ltd." has been made available to this company (the company previously operating under that name having recently changed this name to "Astraseal Ltd.").

All correspondence and inquiries relating to Chelle machines should be addressed to the company at 40, Brook Street, London, W.1.

R.S.I.'s views on food colouring

The Royal Sanitary Institute has considered the recommendations of the Preservatives Sub-Committee of the Food Standards Committee Report on colouring matters and has made the following comments and observations to the Ministry of Food:

> "That the Institute is of the opinion that a combination of specified colourings should only be permitted if the Sub-Committee is assured of the safety of the combination, and that it will have no deleterious effects on the health of the general public."
>
> Further, that the Institute "are not aware of the exceptions which the Sub-Committee had in mind, but consider that exceptions should only be made in very limited, specified cases."
>
> "That the purchaser should be notified that no colouring matter has been used which has not been approved by the Ministry of Food."
>
> Also, that "bleaching agents, clarifiers and similar substances should be regarded as being in the same category as colouring matter."

The Institute is asking for information as to how such regulations are to be enforced, particularly with regard to the detection and subsequent analysis of colouring matters.

COMPANY PROFITS AND PROSPECTS

Cow and Gate's lower profits

Group profits of Cow and Gate, infant and invalid food manufacturers, for the year ended September 30, 1954, amounted to £953,618 before tax (£1,061,590). After all charges, including tax, the net profit applicable to Cow and Gate was £384,163 (£474,902). A dividend of 15% on capital of £1,794,914 as increased by exercise of options, is proposed. For the previous year, to September 30, 1953, the dividend was 17½% on £1,504,741.

■

Sugar company's record year

Mr. A. E. Berry, chairman, Manbré and Garton Ltd., said in his statement for the year ended September 30, 1954, that the total profit of the company and its subsidiaries was £1,588,849—a record for the company up to date. After providing for dividends, taxation and reserves, the balance carried forward in the accounts of Manbré and Garton Ltd. was £277,530 and in the consolidated balance sheet the amount to be carried forward was £766,572. Cash at bank and in hand in the parent company's balance sheet fell from £581,381 to £181,547, but on the other side creditors had been reduced by approximately £500,000. In the consolidated balance sheet, however, cash at bank and in hand stood at £1,087,274. A final dividend of 22½%, less tax, making 30%, less tax, for the year, was made.

■

New canned fish for cats

Mr. F. J. Sanguine, chairman and managing director, Spratt's Patent Ltd., announced in his statement for the year ended September 30, 1954, that arrangements had been completed for national distribution of a canned all-fish product for cats "which will meet a long unsatisfied demand in the market." The company's subsidiaries had in the main continued their successful trading and again contributed substantially to the Group profit. The continued progress of Hygienic Wire Works Ltd. was already demanding further expansion of premises and plant and new factory construction was also proceeding for two other subsidiary companies. The dividend for the year was 12½% (same). The attributable net profit from the Group to Spratt's Patent was £111,687 (£76,794).

Brook Motors' Swansea branch

Brook Motors announce the removal of their Swansea branch to larger premises at 93, Walter Road, Swansea (telephone Swansea 57559).

Dr. J. G. Davis visits Spain

Dr. J. G. Davis has been invited by the College of Veterinary Surgeons in Spain to give a series of lectures on recent advances in dairy science and public health in relation to food. He will be away from England from April 28 to May 26. Dr. Davis is the author of "Dictionary of Dairying" published by Leonard Hill Limited (65s. net.).

Cheaper Danish lard

The London Provision Exchange with leading British importers have agreed to a further reduction in the price of pure Danish lard with the Danish Lard Board. The new retail price for *Danelard* is expected to be 1s. 8d./lb.

Since last August the retail price of *Danelard* has been reduced by 6d./lb., and it now costs 3d./½ lb. less than the various cooking fats produced from vegetable oils.

In the five months from August 1 to December 31, Denmark exported 5,200 tons of lard to the U.K. to the value of nearly £1 million. This amounted to about 30% of Denmark's lard export for the whole year.

Higher fees for trade marks

From April 1 higher renewal fees are being charged for trade marks registrations due to expire after June 30, 1955. After this date there will be a general increase in the fees payable in respect of a number of trade marks matters.

The fees have remained substantially unchanged for many years despite considerable increases in administrative costs.

This change is announced by the Board of Trade who have laid before Parliament revised rules which amend those made under the Trade Marks Act, 1938.

A similar announcement regarding higher renewal fees for patents and designs was announced on January 31, 1955.

Maestrani's agents

L. I. Silber and Co. Ltd., of London, ask us to point out that they are the sole British agents of Maestrani Schweizer Schokoladen, A.G., whose factory was featured in the February issue of FOOD MANUFACTURE.

Correction

In the article on Batchelor's packet soup mixes in our March issue we incorrectly stated that the mixers were supplied by Robert Morton and Co. Ltd., instead of by Morton Machine Co. Ltd. We regret the error.

Fruit and vegetable canners make new record

Production of canned fruit and vegetables was a record in 1954, according to a recent Ministry of Food statement, based on returns from licensed canners.

Fruit production reached 89,800 tons compared with 72,500 tons in 1953. Vegetable production was 373,700 tons (334,000).

A high output of processed peas was responsible for the 39,000 ton increase in canned vegetable production during the year. Comparatively small increases were recorded for fresh peas and beans. There were reductions in carrots and macaroni and spaghetti in tomato sauce.

Canned fruit production did not rise so much, though it was still greater than in the peak year of 1949. The output of canned plums, at 21,500 tons, showed a recovery from the very low 1953 level but still remained considerably below that of previous years. Small increases were shown for strawberries, gooseberries, rhubarb, cherries and many other varieties.

New Birmingham office for Honeywell-Brown

Two years have passed since Honeywell-Brown Ltd. opened their first Birmingham office. During that time the demand for industrial instrumentation and automatic controls for space heating, ventilating and air conditioning has continuously increased.

To meet this accelerating demand the Birmingham office has now moved from Stephenson Place to larger premises in Sutton New Road, Erdington, Birmingham, 23.

Under the management of Mr. P. R. Prior the new office will provide improved sales and service facilities in the Birmingham area.

Dr. Hill leaves Food Ministry

The new Parliamentary Secretary to the Ministry of Agriculture, Fisheries and Food is Mr. Harmar Nicholls, in the reconstituted Cabinet announced by Sir Anthony Eden, the new Prime Minister. The former Parliamentary Secretary, Dr. Charles Hill, is now the Postmaster-General, and becomes a Privy Councillor.

Crane Publicity's silver jubilee

Mr. Jimmy Sayles, managing director of Crane Publicity Ltd., was host at a cocktail party held at the Mayfair Hotel, London, last month to celebrate the silver jubilee of his company. Besides handing national advertising accounts, Crane are responsible for a number of technical accounts. The diversity of their interests was well illustrated in a not too serious brochure about their first 25 years which was given to guests.

Machinery Makers' Problems Discussed at Luncheon

The stainless steel shortage and payments problems with Brazil and other South American countries were picked out as major current difficulties confronting member firms of the Food Machinery Association by the chairman, Mr. C. S. Robinson, speaking at the annual luncheon on April 21 at the Savoy Hotel, London. He said that last year food machinery exports were worth £11 million. This was in addition to the contribution which the industry had made to the record exports of £135 million of food during the year. British food machinery makers were ahead of their competitors in delivery and price but this position was threatened by the difficulties mentioned.

Mr. Robinson then introduced the chief guest, Mr. C. S Dence, president of the Food Manufacturers' Federation, who referred to the growth of the food industry. If farmers were included, the food industry of Britain employed 2,600,000 workers and was the biggest in the country. Last year 32% of personal incomes was spent on food. But the industry could anticipate still further growth as was proved when, for instance, canned food consumption here and abroad was compared. In 1953 U.K. consumption was 33 lb. per head while Canada's was 94 lb. and the United States' was 120 lb.

New London offices

The London offices of The British Wedge Wire Co. Ltd., Warrington, makers of *Wedco* mechanical handling equipment, have been moved from 687 Finchley Road, N.W.2, to larger premises at Elmswood House, Bounds Green Road, N.11.

The move also affects Modern Mechanisation Ltd., another member of the organisation. The new telephone number is Bowes Park 8442 (4 lines) and the telegraphic address, Modmec, London, N.11.

Electricity in the food industry

Great Britain is now using nearly twice as much electricity as immediately before the war and 20,000 million units more than only six years ago, Lord Chandos, chairman, Associated Electrical Industries Ltd., said in his review of 1954. Some of this increase, the review continues, has gone into homes, farms and shops. Over 62,000 farms have been connected in the past six years. The part played by the A.E.I. companies in supplying much of the generating and other electrical equipment which has made this possible is well illustrated by the review.

Numerous examples of the way in which electricity — and associated equipment — are today helping in the production, storing and selling of food are given by Lord Chandos. One example—illustrated by a photograph—is of a *Coldrator* cooling installation now in use on a large mushroom farm.

Refrigeration has particular importance in the staple industries overseas. An example shown in the review is a freezing room in New Zealand. The particular plant instanced has a storage capacity capable of taking 20,000 cu. ft. of egg pulp. It is one of the many *Coldrator* installations used by Canterbury Co-operative Distributors Ltd., for the storage of eggs, bacon and table poultry.

International Foodstuffs and Packaging Fair

The tenth International Foodstuffs and Packaging Fair is to be held at Parma, Italy, from September 20 to 30, 1955. This fair covers the entire cycle of food production by its inclusion of raw materials and machinery for the various branches of the food and packaging industries, as well as finished food products and containers.

Detailed information about the fair can be obtained from the U.K. agents: The Italian Chamber of Commerce, Grand Buildings, Trafalgar Square, London, W.C.1.

Food research and the analytical chemist

The President of the Royal Society, Lord Adrian, was a guest of honour at a dinner held recently to celebrate the 81st anniversary of the Society for Analytical Chemistry. He recalled that when the Society was formed in 1874 as the Society of Public Analysts, it was concerned with preventing additions to food, such as alum to bread, copper sulphate to beer and red lead as colour to cheese. Now the Society was concerned with dietary necessities, and the public was all vitamin-conscious. He recalled that 40 years ago he had worked in Cambridge in a cellar adjoining that in which Gowland Hopkins had performed his famous investigation into the dietary needs of rats. Food was now only one of the many interests of the Society. Analysts worked out new methods for complicated compounds, and the Society kept in touch with the march of progress in the introduction of chromatography, polarography, electrometry and rheology. When the Society of Public Analysts became the Society for Analytical Chemistry in 1953, and a separate body was founded to take over the professional interests of Public Analysts, it became a learned society in the full technical sense, and was concerned with the whole field of analytical chemistry. In his opinion analytical chemistry was one of the finest exercises in practical and academic analytical method.

The President of the Society, Dr. D. W. Kent-Jones, in reply, thanked Lord Adrian. The Society was vigorous and expanding, and was proud of the work it did for industry and the nation. It was a little venturesome. It was not so young as was suggested by its change of name, but there was no change of heart. He gave his personal thanks to two distinguished guests, Lord Adrian and Mr. J. Arthur Rank. He surrendered his office as President to Dr. K. A. Williams completely confident in the future of the Society.

Dr. H. M. N. H. Irving, proposing the toast of the guests, welcomed J. Arthur Rank, representing the milling industry, Alan Baker, President of the Society of British Millers and Norman Wright, scientific adviser to the Ministry of Food.

Mr. Rank said that it was a pleasure and a privilege to reply on behalf of his fellow guests. He was aware of the great importance of chemical analysis to industrial life: it was vital to films, flour and agriculture. He thanked the Society for its hospitality and wished it success in the years to come.

Frozen milk sticks

Newest frozen confection is milk frozen-on-a-stick. In effect a lollie, it is said to be the answer to critics who without qualm or qualification allege that ice lollies almost entirely lack nutritious value. Introduced the first week in April by the Eldorado Co., this novel confection called a "milk frol" is claimed to reach a higher standard of nutritious value than liquid milk itself. Energy value of 100 fl. oz. of liquid milk is 2,100 calories, of milk frol 3,412 calories. A usual portion of average ice cream has been calculated to provide 50 calories. One milk frol gives over 75 calories. Liquid milk, although the retail price is 7d. per pint, is usually sold in teashops and cafes at 6d., sometimes at 4½d., per one-third pint cup or glass. A milk frol costs 4d.

Full-cream milk is the dominating ingredient. Sugar is added to sweeten, glucose to aid digestibility, butter to enrich and provide more "body" to the product, and some stabiliser to hold the mix together.

The manufacturing process is a cross between the making of ice cream and that of ice lollies. Processing follows ice cream practice to the freezing stage and there is then a switch over to lollie making procedure for brine tank freezing and individual bagging. Present production can reach 30,000 an hr.

Food News Overseas

Nationalised beer for Sweden?

The Swedish brewing industry is to be studied by a committee appointed by the Ministry of Finance to decide to what extent Government control should be increased and whether the industry should be nationalised.

France exporting sugar

For the first time for many years, France is to export large quantities of sugar. In 1955 the exports will amount to about 180,000 tons, in addition to the 300,000 tons coming from countries of the French Union.

New milk plant for Egypt

Establishment of a milk pasteurisation and bottling plant has been approved by the National Production Council of Egypt. A private company, Société Misr Laitière et Alimentaire is being formed with a capital of £E.400,000.

Chile plans more cold stores

The Instituto Nacional de Comercio, Santiago, Chile, plans to spend 100 million dollars on a nation-wide scheme of cold storage construction. The programme provides for refrigeration plants at Iquique, Arica, La Serena, Illapel, San Antonio, Talca, Rancagua, Linares, Chillan, Los Angeles, Temuco, Valdivia and Puerto Montt. The programme may provide openings for British equipment.

Rhodesian sugar scheme fails

The pilot sugar growing scheme in the Gwembe Valley of the Zambesi started by the Northern Rhodesian Government has been abandoned. Good yields were obtained only from small areas. An air survey is being made to find another economic block of about 5,000 acres to start another scheme. Meanwhile, the sugar scheme on the south bank of the Zambesi, run by Chirundu Sugar Estates, goes ahead and should produce 8,000 tons of sugar by 1956.

"Spam" to be made in Eire

Lunham Bros., bacon curers, Cork, have secured the manufacturing rights of *Spam* under licence from George A. Hormel, of Minnesota, the inventors of the food.

Production has started in the Irish factory and the annual output is expected to be 4 million 12 oz. cans a year. Made from the shoulder of the Irish pig with some ham added, the *Spam* will be exported to Britain and Belgium as well as being available on the Irish market.

The Irish product will not contain more than 28% fat. It will have all coarse tissues eliminated during processing and will be similar in every other respect to the American product which during the war was sent to Britain under Lend-Lease.

The outgoing president of the American Society of Bakery Engineers Wallace K. Swanson (right) hands on the gavel to his successor Martin Eisendstaedt, at the 31st annual meeting of the Society in Chicago.

Ginger ale aids cardiologists

Ginger ale has been used by American doctors to obtain a better X-ray picture of the surface of the heart. Drunk by the patient immediately before examination, the ginger ale produces an artificial stomach bubble that aids visualisation of the heart's surface. By the technique, correct estimates of the size of enlarged hearts, previously erroneously measured, were made possible. Soda water or other carbonated beverage can be used as well as ginger ale. The doctors report their work in the *Journal* of the American Medical Association (1955, **157**, (9) 712).

Herring catch sinks boat

A Norwegian fishing boat recently sank off Bergen when the tens of thousands of herring caught in the boat's purse-seine suddenly dived to the sea floor. The six men on board jumped overboard and were picked up by another boat. A little later the purse-seine reappeared on the surface, and with it the fishing boat. The catch—more than 100 tons of herring—was retrieved.

Fish meal plant for Canada

For their new fish processing plant at Gaspé, Quebec United Fishermen have placed an order with Power-Gas Canada Ltd., of Montreal, for the supply of a complete Rosedowns fish meal plant.

This plant will be of advanced design and fully continuous in operation, producing a high protein meal from up to 5 short tons of oily and non-oily fish and fish offal/hr. The plant will be installed during the autumn and it is hoped to carry out trial operations before the end of this year's fishing.

Power-Gas Canada Ltd. is an associate company of the Hull firm of Rose, Downs and Thompson Ltd.

Big pimento crop in W. Indies

One of the largest pimento crops in actual tonnage for many years has been reported from Jamaica. Many growers who held back their stocks to wait for an increase in the Government controlled price of 171s. per 100 lb. are now offering pimento to the Government, and some sales are reported at 2s. and 2s. 3d. per lb. to merchants who will eventually sell next August to the Government for export. The new Government has now reversed the former policy of keeping prices at economic levels and has decided to sell, at 750s. *ex* dock, the rest of the 400 tons in the warehouse, which has been held back since the Government cancelled the quota system of selling through its export agents.

This cancellation placed many shippers who had promised their customers supplies in an embarrassing position, reports the Carribean Commercial Agency Ltd., as they have been obliged to cover in on the London market at the 750s. level. Some have claimed *force majeure* so that C.C.A., as brokers, have had to pay their losses. Now that all sales have been covered, the price on the free market has rapidly declined.

Food Packaging

Coated papers and boards

Following the installation of new plant the Telegraph Construction and Maintenance Co. Ltd. (Telcon) will feature *Telcothene* coated papers and boards up to 72 in. in width at the British Plastics Exhibition, Olympia, from June 1 to 11, next. The characteristics of *Telcothene* are said to make it ideal for use where a heat-sealable, hygienic material with low water vapour permeability is required. Its many applications include:

A wrapping medium for food; a moisture barrier and anti-scuffing medium in multiwall paper sacks; drum liners particularly for the packing of materials that are affected by moisture; facing papers in cap liners.

For packing material for service equipment to be stored under tropical conditions the company will also be showing metal foil laminate manufactured in conformity with M.O.S. Specification C.S.2200B.

A short demonstration showing the versatility and ease of application of *Telcothene* powder to metal objects of irregular shape will be another feature of the Telcon stand. *Telcothene* powder when fused imparts to metal surfaces an insulated plastic coating which provides protection against corrosion, mould growth and fungus and is chemically resistant. The powder is available in a range of attractive colours.

Three of a range of twelve can labels for the products of Smedley's new factory at Limassol, Cyprus, which comprise fruits, fruit juices and vegetables. The labels were designed and printed by the Brown, Bibby and Gregory branch of the Metal Box Co. Ltd. Printing is by the "Lithesk" method which extracts a wide tonal range from four standard colours. The cans were also supplied by Metal Box.

A whisky bottle specially designed to appeal to people with a craze for finding uses for discarded objects has been introduced in the U.S. by Brown-Forman Distillers Co. for their Old Forester brand. One use is the wall planter shown in the photo; it is made from a bottle and a round metal ash tray. Other ideas: hurricane lamp, salt and pepper shaker, candle stick.

A selection of *Telstic* coated materials will also be on display. *Telstic* coating on metal foil and paper is widely used in the crown cork industry, and also meets a demand from the footwear and clothing industries.

Electric tape sealing

An automatic sealing machine for gummed tape was shown by Samuel Jones and Co. Ltd. at the Factory Equipment Exhibition. The machine, called the *Electric Tapeshooter*, is equipped with a foot control unit for two lengths of tape, which makes it possible for the packer to have both hands free. Button control is also provided. It can be set to give a choice of two pre-determined lengths of sealing tape from 6 to 50 in. Intermediate lengths can be measured if required.

The new "SecuRO" seal introduced by Metal Closures Ltd. Photos show: *top*, the pilferproof seal fixed and ready for transport; *bottom*, the seal broken. It gives a distinct click on opening, confirming that the contents have not been interfered with.

New pilfer-proof seal

The *SecuRO* seal is an improved bottle closure which is claimed to provide 100% tamperproof protection combined with effortless opening, its security band screwing off easily once the bottle is opened.

Besides being easier to open than the normal pilferproof roll-on bottle closure, the seal, which is being introduced by Metal Closures Ltd., also obviates the necessity of cutting the security band from the neck of returned bottles before they are washed. The top part of the new seal has a right-hand thread, and the security band a left-hand thread, making it easy to break the perforated portion between the two parts by unscrewing. The seal can be applied by any of the R.O. range of sealing machines, if suitably adapted. A special bottle with two threads has to be used.

SecuRO seals will be available shortly in the 31·5 mm. size, and it is intended to make them in other sizes later.

Recent Patents

COMPLETE SPECIFICATIONS ACCEPTED

730,785. REID, J. S. and CAMERON, R.: Potato baskets.
730,810. BROADBENT, T. E.: Machine for making sheets of pastry.
730,810. REGET, G.: Baking pan and conveying device.
730,887. A.B. SEPARATOR: Fat-containing, stable milk or cream resembling product.
730,946. KORK-N-SEAL LTD.: Bottle closures.
730,959. FEJER, G.: Electrically heated cooking apparatus.
731,042. GRASSO'S MACHINEFABRIEKEN N.V.: Ice block freezing apparatus.

ABSTRACTS OF BRITISH PATENTS

Improved cheese packaging

This invention relates to an improvement in cheese packaging and more particularly to an improved package or container for cheese and to an improved cheese wrapper. It provides a cheese package comprising cheese enclosed in a heat-sealable, grease-resistant, moisture-proof container consisting of an outer base sheet having an oxygen permeability of not more than 250 c.c./sq. m./day at 45°F. and 760 mm. and a carbon dioxide permeability in excess of the oxygen permeability. This covers an inner continuous film of a composition comprising, by weight, 3 to 40% of polythene having a molecular weight of 12,000 or over, 25 to 50% solid poly*iso*butylene having a molecular weight of at least 60,000, and 10 to 72% petroleum wax. The film has a gas permeability in excess of the base sheet, the container inhibiting moisture loss from the cheese packaged in the container and being peelable from the cheese. The carbon dioxide permeability of the container permits the carbon dioxide gas generated by the cheese to escape from the package and the oxygen permeability of the container prevents oxygen from entering the package in an amount sufficient to cause an off-flavour on the surface of the cheese.

Marketing cuts of natural cheese in consumer sized units of one, two, five or ten pounds has not been very successful because of the difficulties encountered in obtaining a satisfactory package from the point of view of shelf life, appearance, and ease of opening and using. Natural cheese, and particularly cut natural cheese, has certain properties which present difficult packaging problems, for example, natural cheese evolves, even after aging, a considerable quantity of carbon dioxide. If this evolved gas is not permitted to escape from a package, it will cause the package to bloat and in some cases even to burst. On the other hand, natural cheese is susceptible to oxidation with a resulting development of an off-flavour on the surface of the cheese. Consequently, the cheese must be protected from oxygen.

Natural cheese contains a great deal of cheese grease or cheese oil. In large cheddars this cheese grease or oil is partially retained in the cheddar by a skin or rind which develops during aging, whereas, with cut natural cheese the cut surfaces exposed to the wrapper exude this cheese grease. With wrapping materials of the coated type which hitherto have been used on natural cheese this cheese grease attacks the coating and has been responsible for a breakdown in the protective features of the wrappers as well as the seals which are made at the time of wrapping. Natural cheese is very susceptible to mould which is due in part to the presence of air and which it has been found can be prevented to some degree by maintaining a wrapper in close intimate contact with the surface of the cheese. Still one further property of natural cheese is that it has a tendency to lose moisture, which loss of moisture results not only in drying of the texture of the cheese but also in loss of weight.

A successful package of natural cheese, therefore, must be one in which all these various properties are compensated for to the end that the cheese will have a shelf life of at least three months without any substantial impairment of flavour, without moulding, and without losing weight and texture. Furthermore, the package should be in such condition that in handling it is dry to the touch and that its seals have not been impaired in appearance as well as in fact. The package must be readily opened to expose the cheese by simply peeling the wrapper from the surface of the cheese which results only where any coating forming a part of the wrapper adheres to the base sheet and where such coating or film does not readily tear. Any package, which upon opening, requires scraping the cheese surface before the cheese may be used does not meet with consumer acceptance.

In general the cheese container or package enables carbon dioxide to escape from a cheese pack without allowing oxygen to enter in sufficient quantity to cause off-flavours. The pouch is made of regenerated cellulose (*Cellophane*) coated inside with a mixture of polythene, poly*iso*butylene and petroleum wax of specified composition. This inner coating makes the pack waterproof, prevents the growth of moulds on the cheese, and causes the film to cling to the cheese and give the pack an attractive appearance.—719,664. *Marathon Corporation, U.S.A.*

Improvements to coffee mills

This invention relates to coffee mills in which a grinding mechanism is inserted in the aperture of a container of wood, sheet metal, etc., for the reception of the ground product.

In known coffee mills of this kind the mechanism is firmly connected with the container in such manner that moving the complete machine is difficult, particularly if it is intended for use in travelling. Further it is necessary to have a constant size of container, even if for particular purposes, e.g. when travelling, a smaller container would suffice.

The invention eliminates such disadvantages. The entire grinding mechanism forms a unit assembly held removably in the container by means of a bayonet joint. It is thus possible to separate the grinding mechanism and the container from each other instantaneously, at any time, and either convey the entire machine in the dismantled state, or exchange the container for another of greater or smaller size.

The complete coffee mill consists of a container of wood or other suitable material, and a grinding mechanism. The grinding mechanism is inserted as a unitary assembly in the upper aperture of the container, and held there by a bayonet joint. It can thus be released at any time by a slight turning movement and applied to another container; e.g. a smaller, sheet-metal container having an aperture of the same size and suitable for travelling purposes and provided with bayonet slots.

To prevent the grinding unit from turning backwards after being attached to the container, and thus releasing the container, a stop is provided which holds the grinding unit and the container together after the bayonet connection has been made. The open edge of the container can be equipped with a spring-loaded pin which when the grinding unit attains its correct position relative to the container, engages in a corresponding hole of the adjacent edge of the grinding unit and thus locks the assembly in position. To release the mill from the container, the pin must be released from the hole before turning back the grinding unit.—725,532. *Alexander Ahner.*

ABSTRACT OF FOREIGN PATENT

Edible synthetic fats

The paraffin-like products resulting from carbon monoxide hydrogenation are oxidised and the fatty acids obtained esterified with glycerol to give edible fat products of a good smell, compatibility, taste, and resorption property. A CO hydrogenation product, boiling range 300-400°, is oxidised at 110° in the presence of 0·1% manganese clupanodonate. The oxidation product is saponified, and the unsaponifiable constituents are removed by distillation. The crude fatty acid mixture is purified by distillation *in vacuo* (about 4-8 mm.). The fraction (200 g.), boiling range 150-270°, is esterified with 30 g. glycerol *in vacuo*. The unreacted components are removed by distillation. The remaining ester, acid no. 3, is refined and, possibly, bleached. —German 767,825. *Markische Seifen-Industrie.* Through *Chem. Abstracts.*

Information and Advice

This Service is available to subscribers to Food Manufacture. If a stamped addressed envelope is enclosed replies will be sent by post, but enquiries cannot be answered by telephone.

Flavours for jelly crystals

B.7403. *Can powdered essences be used in the manufacture of jelly crystals and will they improve the keeping qualities of the flavour? We are particularly interested in view of the climatic conditions in India.* (Bombay)

The use of powder flavours in packed foods such as jelly crystals has distinct advantages over liquid flavours. There is, of course, the question of easy incorporation, but more particularly powder flavours will stand up to normal storage conditions more satisfactorily, and there will be less deterioration in flavour.

Vanilla sugar

B.7370. *We should be glad if you could let us know the formula for preparing vanilla sugar.* (Bombay)

The following recipe for vanilla sugar is suggested by Bennett:

Powdered vanillin	.. ..	7 oz.
Powdered coumarin	.. ..	1 ,,
Confectioner's starch	.. ..	5 lb.
Corn starch	.. .. ..	1 oz.

Use instead of liquid vanilla flavouring. One teaspoonful flavours 1 qt. of liquid.

Coconut oil extraction

B.7360. *Please recommend some good books on the extraction of coconut oil.* (Bombay)

We have not been able to find any books dealing specifically with the extraction of coconut oil. There is a book called "Coconuts," by M. Subedar (70 pages, Rs. 1, 1945, Padma Publications Ltd., Bombay), but we have not been able to see a copy.

Probably one of the best books covering the subject is E. W. Eckey's "Vegetable Fats and Oils" (1954, Chapman and Hall, 132s.). We particularly recommend Chapter 11, "Palms and other Monocotyledons."

You may also be interested in the following references in the periodical literature:

1. Anon., "Coconut Oil," *Soap* (India), February, 1952.

2. M. R. C. Menon, "Edible refined and deodorised coconut oil," Coconut Industry of Ceylon, Souvenir Issue, 1952, p. 15.

Preserving pork pies

B.7438. *We make pork pies and would like advice on how to preserve the pork during warm weather. How should we get the red colour the public seems to like? We believe that butchers wet the pickle pork before use in a solution of saltpetre and salt and leave for seven days which gives it a red colour. Can you please let us know what quantities to use, etc.?* (Birmingham)

Pickling fresh pork in a brine (salt solution) does help to preserve the meat, and saltpetre is added to give the meat a red colour. Saltpetre should always be dissolved in boiling water before being added to the brine. Sugar is often added to give an improved flavour, and spices can be soaked in the brine.

Pickling should be carried out in a cool place, and the following mixture can be used for ordinary pork:

Water	.. .. ..	25 gal.
Salt	.. .. ..	38 lb.
Sugar (optional)	.. ..	3¾ ,,
Saltpetre	.. .. ..	¾ ,,

The solution should be kept at a constant strength of 65° on a salinometer.

Information supplied

The Enquiry Service has dealt with requests for the names of manufacturers and suppliers of plant, machinery and materials and also general information as follows:

B.7429. *Quotations for automatic feeding, filling and sealing plant.* (Karachi)

B.7431. *Suppliers of poultry plucking machines.* (Kenya)

B.7433. *Information on "cloudifiers."* (Feltham)

B.7434. *Formula for dry mushroom soup.* (London)

B.7435. *Makers of plastic forming machines.* (Calcutta)

B.7436. *Test for protein, lime and oil content in animal feeds.* (Dublin)

B.7437. *Vegetable cutting machines.* (Holland)

B.7438. *Preservation and colouring of pork pies.* (Birmingham)

B.7439. *Advice on sealing machines for cartons.* (Aberdeen)

B.7441. *Recipe for vegetarian meat.* (Norfolk)

B.7442. *Information on sugar juice clarification.* (Chicago)

B.7443. *Recipe for cake mix.* (S. Rhodesia)

B.7444. *Advice on meat extract, soup powder and coffee preparation.* (Tipperary)

B.7445. *Information on manufacture of potato crisps.* (Haifa)

B.7446. *Preparation of salted peanuts.* (Tasmania)

B.7447. *Sealing agent for canned foods.*

B.7449. *Manufacturers of wheat cooking machines.* (Herts.)

B.7453. *Manufacturers of corn starch for baking powders.* (Jamaica)

B.7454. *Literature on vegetable dehydration and infra-red blanching.* (Selby, Yorks.)

B.7455. *Information on moisture meter.* (Widnes, Lancs.)

B.7458. *Information on bacterial flavouring of sausages.* (Ontario)

New Companies

Leah Freedman, Ltd. 23, Granville Road, Blackpool. Bakers, manufacturers of and dealers in bread, flour, biscuits, etc. £100. Dir.: Leah Freedman.

Rayner and Sons, Ltd. 201, Garratt Lane, London, S.W.18. To take over business of bakers, confectioners and caterers carried on as "Rayner and Son" at 242, Earlsfield Road, Wandsworth. £3,000. Dirs.: A. J., J. A. and G. W. Rayner

St. Andrews Bakery Products, Ltd. Biscuit and shortbread manufacturers, bakers, confectioners, etc. £100. Dirs.: J. Stewart-Daly, G. Ross and L. F. Lawson.

James Burgess (Ampthill), Ltd. 29, Oliver Street, Ampthill, Beds. Manufacturers and bottlers of and dealers in mineral and aerated waters, soft drinks, etc. £5,000. Dirs.: W. G., J. W. and J. A. Burgess.

Crowndale Bakery Company, Ltd. 17, Thrale Road, Streatham, London, S.W.16. £10,000. Dirs.: J. J. Findlay and P. A. Andrews.

Ivor Dewdney (Birmingham), Ltd. 2, King Street, Plymouth. Manufacturers of and dealers in pasties, pies, cooked meats, etc. £5,000. Dirs.: I. G. C. Dewdney and E. A. F. Brunner.

Oak Farm Wholesale Butchers, Ltd. Oak Farm, Prospect Road, Farnborough, Hants. £1,500. Dirs.: E. J., W. C., W. M. and J. B. Pond.

D. Turner and Son, Ltd. To take over business of butchers, game dealers and slaughterers carried on as "D. Turner and Son" at Mildenhall, Suffolk. £1,000. Dirs.: S. and H. E. D. Turner.

Griendt's Margarine Works and Oil Mills (U.K.), Ltd. 4, Dove Court, Old Jewry, London, E.C.2. £15,000. Dirs.: P. A. Acates and I. S. Hutcheson.

Toni's Cream Ices (Edgware), Ltd. Sinot House, Barnet By-pass, Boreham Wood. To purchase and sell all commodities manufactured or dealt in by Toni's Cream Ices, Ltd. £2,000. Dirs.: R. E. A. Peters and J. L. Gollow.

Toni's Cream Ices (Harrow), Ltd. Sinot House, Barnet By-pass, Boreham Wood. To purchase and sell all commodities manufactured or dealt in by Toni's Cream Ices, Ltd. £1,000. Dirs.: R. E. A. Peters and A. F. Price.

Toni's Cream Ices (Luton), Ltd. Sinot House, Barnet By-pass, Boreham Wood. To purchase and sell all commodities manufactured or dealt in by Toni's Cream Ices, Ltd. £2,000. Dirs.: R. E. A. Peters, P. I. McDowett and Mrs. V. I. McDowell.

Toni's Cream Ices (Portsmouth), Ltd. Sinot House, Barnet By-pass, Boreham Wood. To purchase and sell all commodities manufactured or dealt in by Toni's Cream Ices, Ltd. £2,000. Dirs.: R. E. A. Peters, A. W. and Millicent Powell.

Benjamin Emms and Son, Ltd. St. James Tripery, St. James Abattoir, Filey Street, Bradford, 1. Manufacturers of and dealers in sausage skins and other similar casings, etc. £2,000. Dirs.: B. W. Emms and Mrs. K. M. Emms.

Horrells Dairies, Ltd. 13, Bedford Row, London, W.C.1. £1,000. Dirs.: to be appointed.

From Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C.2.

The Leonard Hill Technical Group this month

Manufacturing Chemist.—Maleic Hydrazide; Quality Definition of Smell; Vitamins, 1; Commoner Antihistamines, 2; Phytosterols of Soya—Chemistry, Properties and Uses; Progress Reports: Pest Control Chemicals, Perfumery, and Disinfectants.

Corrosion Technology.—Protection of Metals by Paints; Corrosion in the Petroleum Industry, 1; Protection of Structural Steel.

Fibres.—Survey of Developments in Instrumentation; FIBRES Review of Instruments; Fibre and Fabric Research; Fibre Data Sheet: Co-polymerisate Fibres; Technical Progress in Man-Made and Synthetic Fibres, 1.

Chemical and Process Engineering.—Hydraulic Transportation of Coal; Chemical Engineering Review: Centrifuging, 2; Report on Conference on the Functions and Education of the Chemical Engineer in Europe; Production of Fresh Water from Salt or Brackish Water.

Dairy Engineering.—British Exports of Dairy Plant; World Trends in Dairy Produce; New Markets for Scottish Cheese; Export Achievements of the Danish Dairy Industry; Cheeses of Great Britain, 10: Caerphilly; British Milk Flavouring Exports.

World Crops.—Maleic Hydrazide as a Plant-Growth Inhibitor; Exports Vital to New Zealand's Forest Industries; Agriculture in the Soviet Union; Evolution of Tillage Implements; Lelydorp Project.

Petroleum.—Instrumentation and Automatic Control in Oil Refineries, 5; Geophysical Methods of Oil Prospecting, 4; Petroleum Chemical Processes, 2.

Atomics.—Problems of Nuclear Power, 1; Some Uses of Radioisotopes in Paper Making.

Paint Manufacture.—Mechanism of the Drying of Oils—Some Recent Advances; Developments in Oils for the Paint Industry; Production of Drying Oils; Thixotropy and Paints, 3.

Building Materials Digest.—Metal Fixing Systems for Insulation Board Linings, 3; New Concrete Units in Construction of a Factory.

Muck Shifter and Public Works Digest.—Caissons and Cofferdams; Drilling for Steam Power; North of Scotland Hydro Board Annual Report.

Trade Marks

APPLICATIONS

SNOWDOWN.—B734,349. Flour. **Joseph Rank, Ltd.,** Millocrat House, Eastcheap, London, E.C.3; Millers.

CHEESE KISSED.—734,525; **CHEESEKIST.**—734,526; **CHEEZKIST.**—734,527. Cereal preparations coated with cheese, the cereal preparations predominating. **Clarks Cereal Products, Ltd.,** Blackborne Road, Dagenham, Essex; Manufacturers and Merchants.

CORNUBIA.—734,714. Flour. **Hosken, Trevithick Polkinhorn and Co., Ltd.,** 40, St. Mary Axe, London, E.C.3; Manufacturers.

ROOIBOS.—734,799. Tea. **Rooibosch Tea Development Proprietory, Ltd.** (a Joint Stock Company duly organised under the laws of The Union of South Africa), 20, Canterbury Street, Cape Town, Union of South Africa; Tea Growers and Merchants.

DRAL.—734,804. Edible oils and edible fats. **Good Taste Foods (Manchester), Ltd.,** 9/17, Harriet Street, Walkden, nr. Manchester; Manufacturers and Merchants.

SUNMORE.—734,806. Nuts (fruits). **Robert W. Close,** trading as **Sunmore (Hull) Products,** 43, Lee Street, Holderness Road, Hull; Merchant.

"TREBOR CHEWS."—735,028. Non-medicated sugar confectionery, chocolate and toffees. **Robertson and Woodcock, Ltd.,** Trebor Works, Katherine Road, London, E.7; Manufacturers.

CHARGER.—735,075. Dried fruits; **ZEBRA.**—735,077. Dates. **Andrew Weir Shipping and Trading Co., Ltd.,** 21, Bury Street, London, E.C.3; Merchants.

COMESCO.—735,080. Flavourings (other than essential oils). **W. J. Bush and Co., Ltd.,** 28, Ash Grove, Hackney, London, E.8; Chemical Manufacturers.

DENCO.—735,228. Canned fish. **Dehn and Co., Inc.** (a Corporation organised and existing under the laws of the State of Washington, U.S.A.), Colman Building, 811-1st Avenue, Seattle 4, Washington, U.S.A.; Canners.

CURLYTAILS.—735,250. Preserved and canned fish. **F. W. Emney, Ltd.,** 4, Drapers Gardens, Throgmorton Street, London, E.C.2; Merchants.

GOLDEN ANGEL.—735,329. Sauces. **Angel Warehouse Co., Ltd.,** 74, Upper Street, Islington, London, N.1; Manufacturers and Merchants.

WHIZZO CRISPS.—735,362. Potato crisps. **Stirk Brothers, Ltd.,** 114, Flinton Street, Hull, Yorkshire; Manufacturers.

GOLDEN MEADOW.—735,483. Dairy cream, cheese, fresh milk, condensed milk, dried milk, milk powder, milk products (for food), eggs, edible oils, and edible fats. **Aplin and Barrett, Ltd.,** Newton Road, Yeovil, Somerset; Merchants.

"MITHRAS."—735,512. Canned fruit. **Peter Alexander Acatos,** trading as **Acatos and Co.,** 4, Dove Court, Old Jewry, London, E.C.2; Merchant.

MOONRAKER.—735,600. Confectionery (non-medicated), and sauces. **Wilts United Dairies, Ltd.,** Bythesea Road, Trowbridge, Wiltshire; Manufacturers.

CERVINA.—735,644. Nuts (fruits), fresh fruits and fresh vegetables. **R. Atcherley and Co., Ltd.,** 21, Victoria Street, Liverpool, 1; Merchants.

From hand-to hand-to hand-to mouth!

In the reign of the first Elizabeth, a perfect complexion was a rose of very real worth. For, alas, most ladies were marked, to a greater or a lesser degree, with unsightly blemishes. The reasons? Perhaps the most important was that their foodstuffs, being passed from hand to hand, were exposed to the manifold infections that swept through the land like ravening wolf packs.

Now those 'good old days' are gone. Thanks to modern packaging our food is protected to a degree unknown to our ancestors. And over half the packaging board produced in Britain is made by Thames Board Mills. So the higher our standard of living rises, the greater the demand for "Thames Board" and "Fiberite" cases. Vital indeed is the part that Thames Board Mills play in the nation's economy.

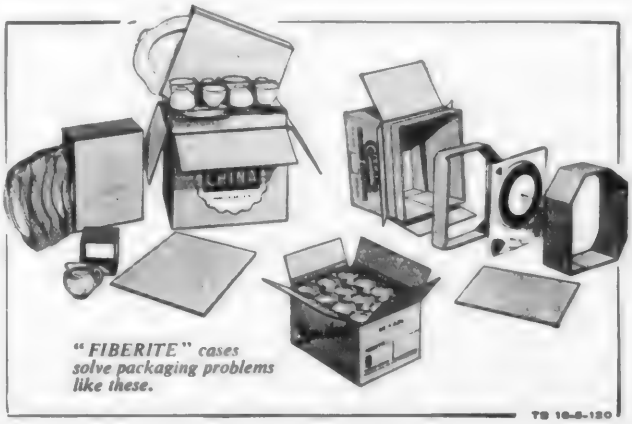
Thames Board Mills Limited

THAMES BOARD

THE LARGEST MANUFACTURERS OF BOARD AND PACKING CASES IN BRITAIN

PURFLEET, ESSEX AND WARRINGTON, LANCS

"THAMES BOARD" for cartons, boxes, bookbinding, etc.
"FIBERITE" Packing Cases in solid & corrugated fibreboard.



"FIBERITE" cases solve packaging problems like these.

TB 10-5-120

ESTABLISHED
1870

Oranges & Lemons *(and Grapes too!)*

In the days of St. Clement, CITRIC ACID, ACID SODIUM CITRATE (AERACIT), *from the acid of the lemon, orange, lime and grapefruit now produced by biological methods,* and TARTARIC ACID, CREAM OF TARTAR, SODIUM POTASSIUM TARTRATE (ROCHELLE SALTS), *from the acid of the grape,* were not known in their pure state.

Manufacturers of high grade food products now find many applications for these materials in all branches of the industry.

Invaluable for jams, soft drinks, jellies, sweets, bottled and tinned products. Cream of Tartar and Aeracit are particularly recommended to the baking trade as high grade aerating agents with absence of end taste.

All are produced in the U.K. to the highest standard of purity by

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Jenkins

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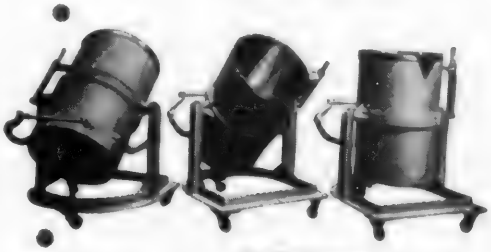
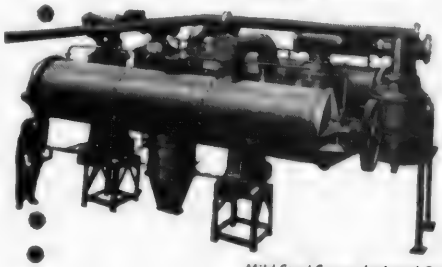
Welded

This 'Ivanhoe' trade-mark betokens a craftsmanship which is proved daily by the dependability of Jenkins-welded equipment in all branches of the Food Industry.

Our new catalogue "Welded Fabrications" is available on application.



40 gallons Stainless Steel Yeast Containers



Mild Steel Steam Jacketed Starch Dryer 3' dia. × 15' 9" long, with dust collectors. Weight 11⅞ tons.

Robert Jenkins & Co. Ltd.
ESTABLISHED 1856
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has the following improvements:

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This improved Morris Electric Chain Hoist is unequalled for reliability and performance.

WRITE FOR FOLDER F159BFM

STAND D506

THE FAST LIFTING BRITISH HOIST WITH THE FLEXIBLE CHAIN

HERBERT MORRIS LTD
P.O. BOX Nº 7
LOUGHBOROUGH ENGLAND

ANY PARENT WILL TELL YOU

that the first steps are the really important ones.
This is as true of effluent treatment as of the white-headed boy, but, with an effluent, the first step is to clear out the solids by the use of the

PARKWOOD MECHANICAL SCREEN

Then you can go forward happily to treatment by chemicals or whatever you wish, without having to bother about all the mass of solid which would otherwise clog your drains and pumps.
We shall have a number of screens showing at Castle Bromwich, stand No. D 535, if you are coming to B.I.F., so do stop and look. Ask questions, too, if you wish, for we shall be only too pleased to give the benefit of our experience.

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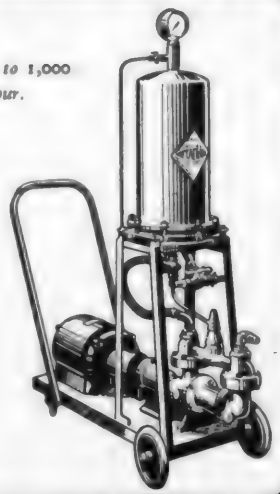
Telephone: MILNSBRIDGE 120

Appearance is Important

Sizes from 1 to 1,000 gallons per hour.



However carefully food products are prepared the customers' standard of perfection is appearance.
The scintillating clarity of Meta-filtered fruit juices, syrups, mineral waters, vinegars, etc., is the hall-mark of purity.

METAFILTRATION

PHONE: HOUNSLOW 1121/2/3
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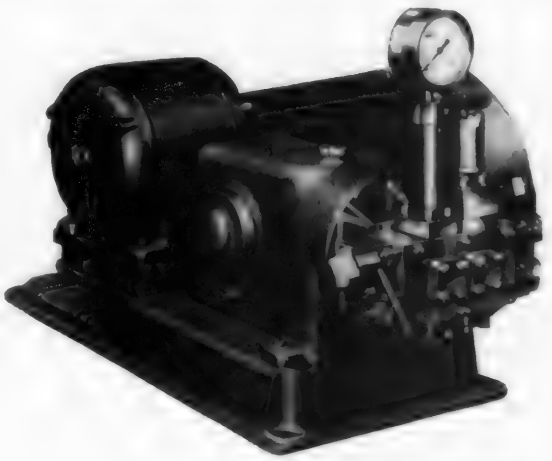

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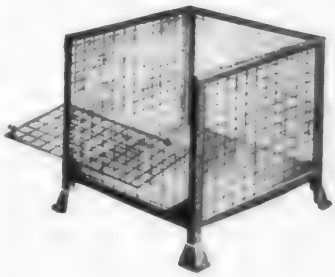

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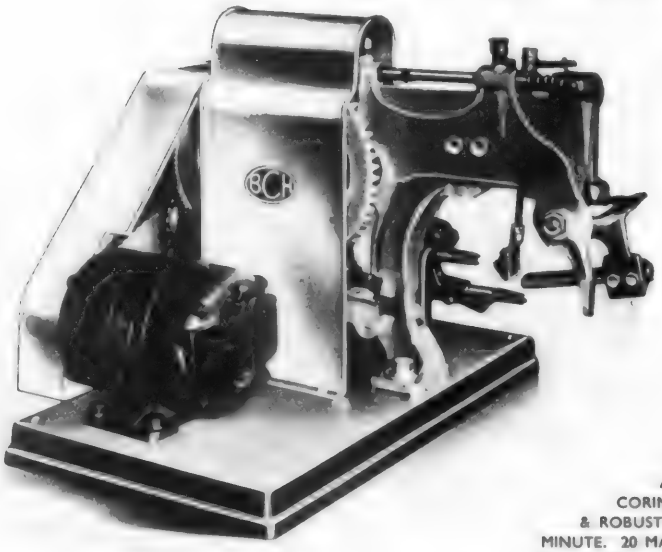

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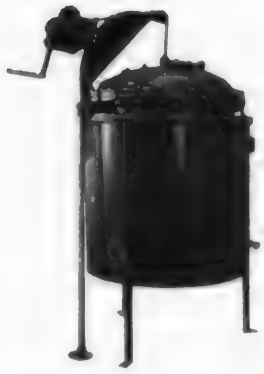

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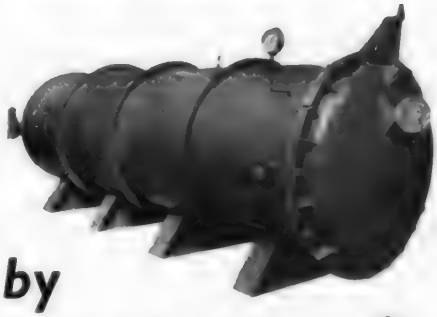

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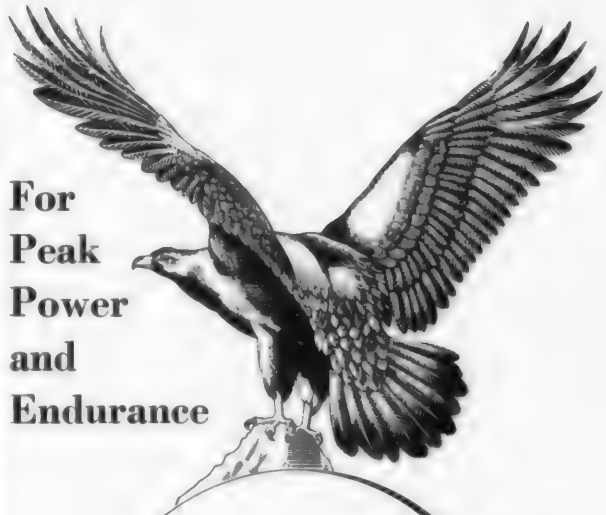

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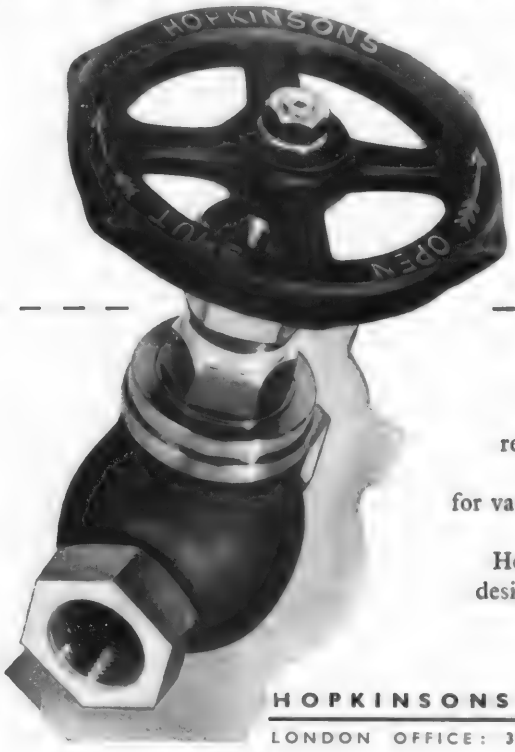

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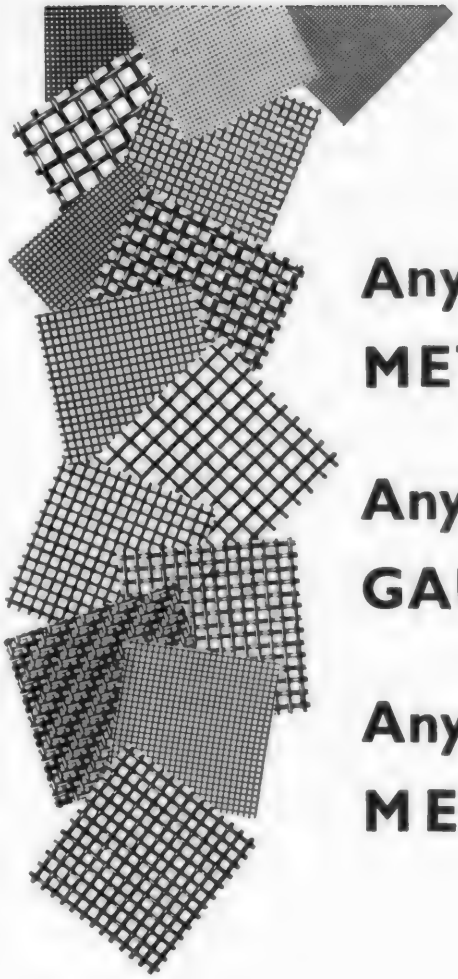

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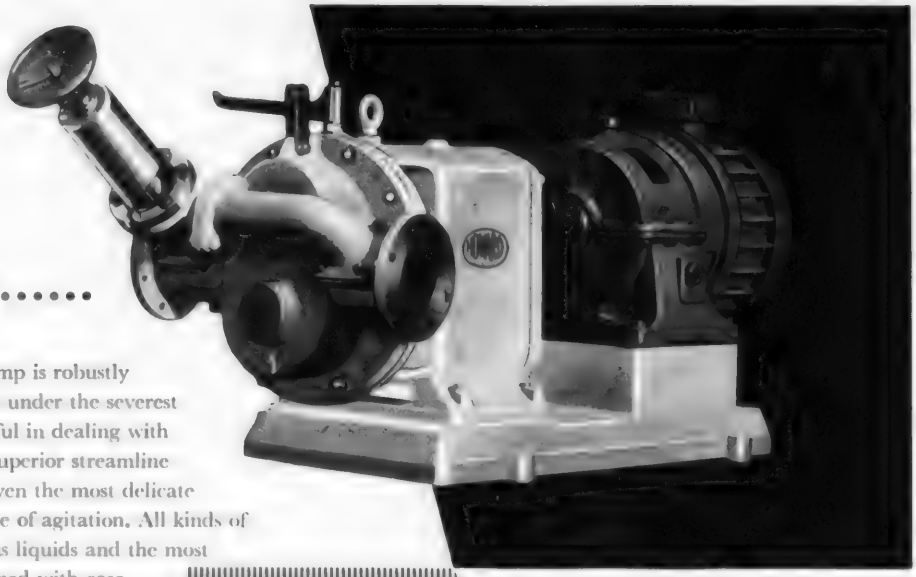

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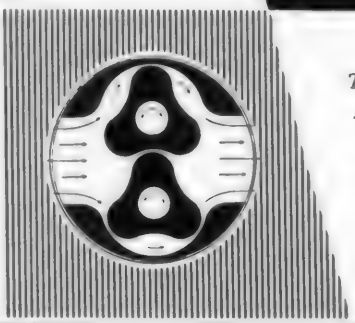

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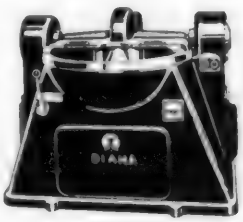

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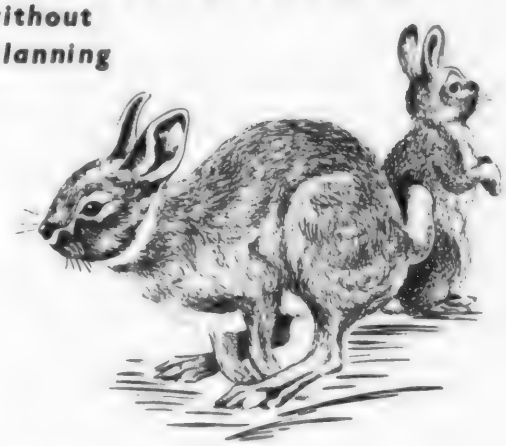

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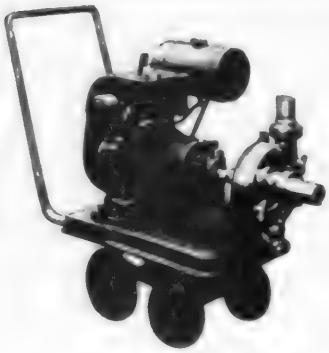

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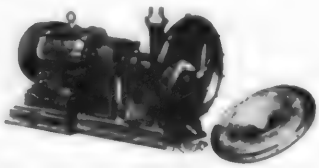

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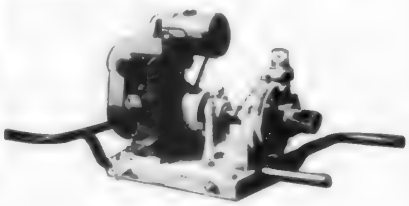

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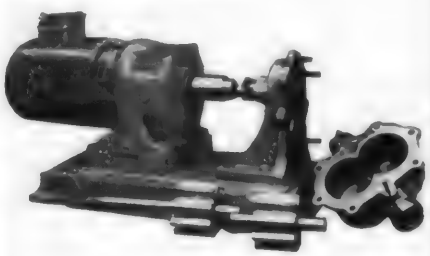

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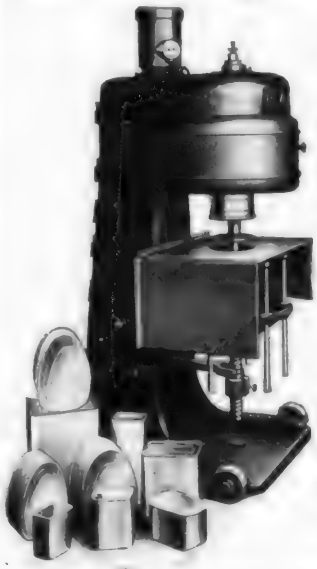

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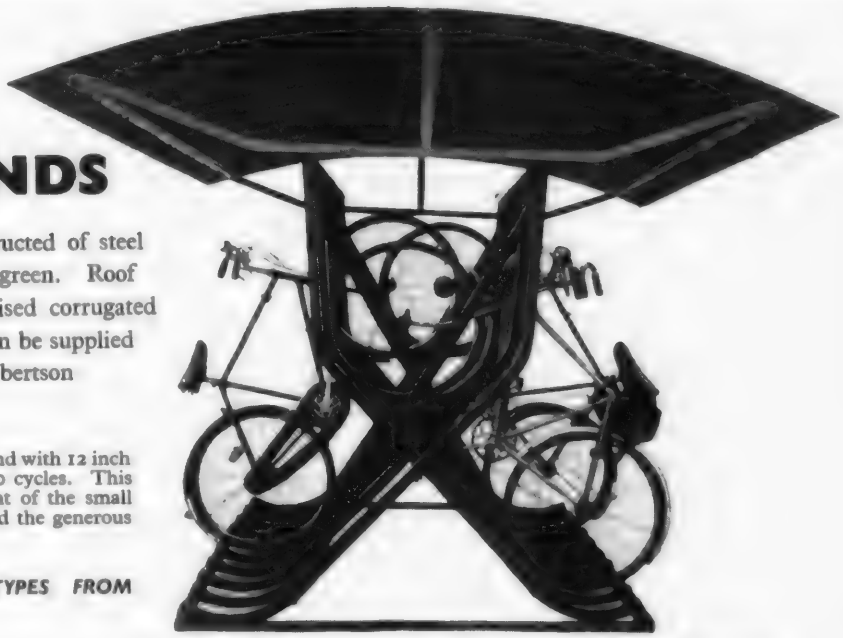

ABIX Cycle Stands are constructed of steel throughout, stove-enamelled green. Roof sheeting is normally of galvanised corrugated sheets. If required, sheeting can be supplied in Aluminium, Asbestos or Robertson Protected Metal.

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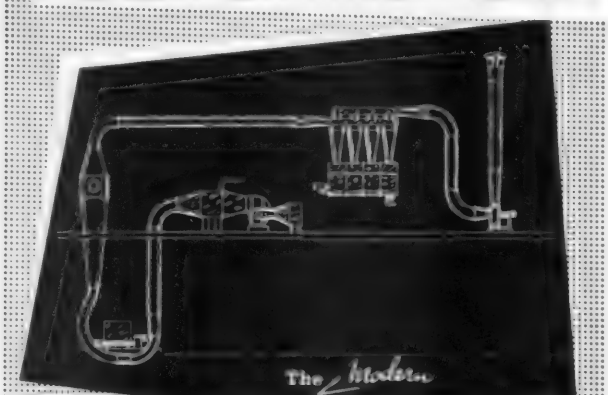

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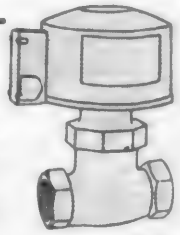

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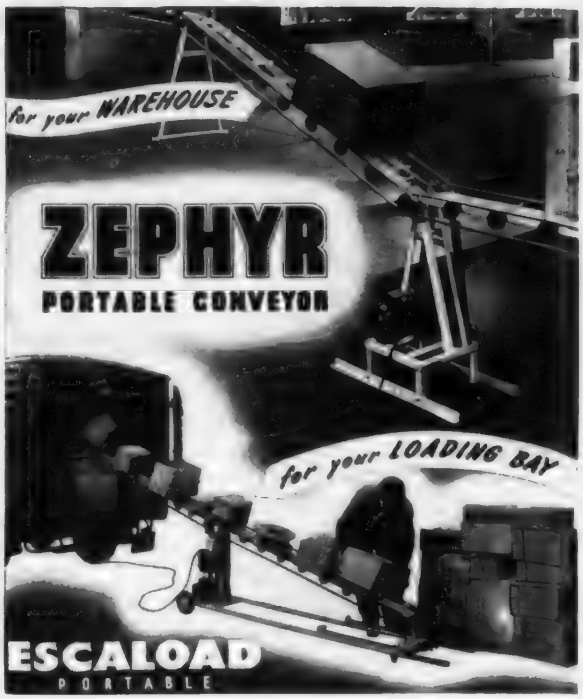

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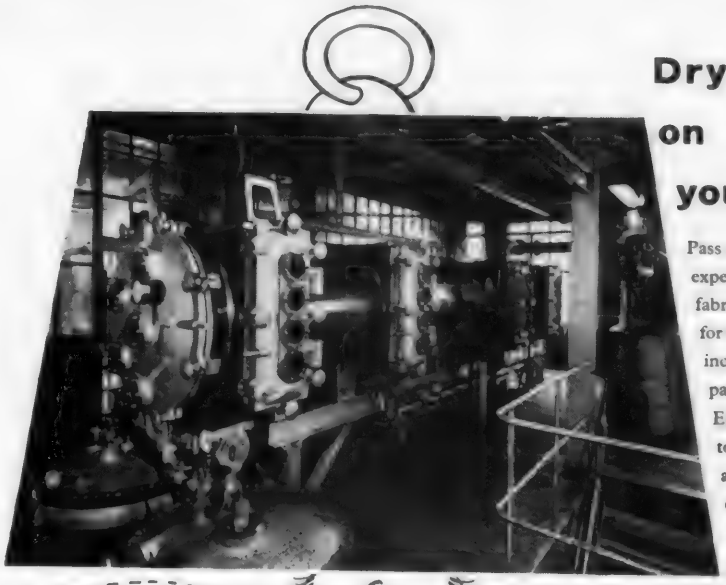

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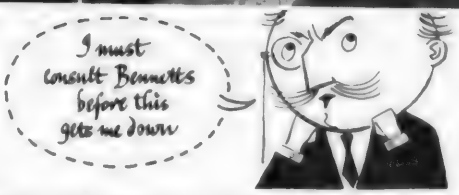

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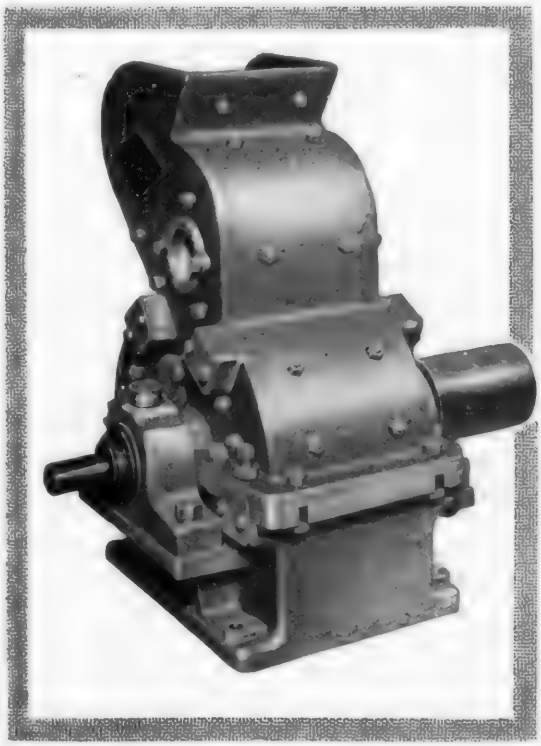

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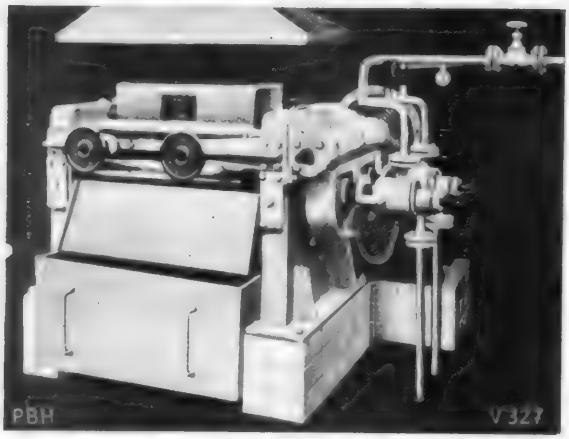

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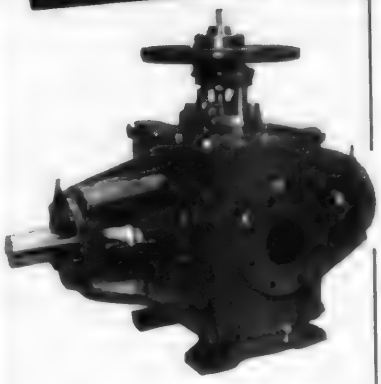

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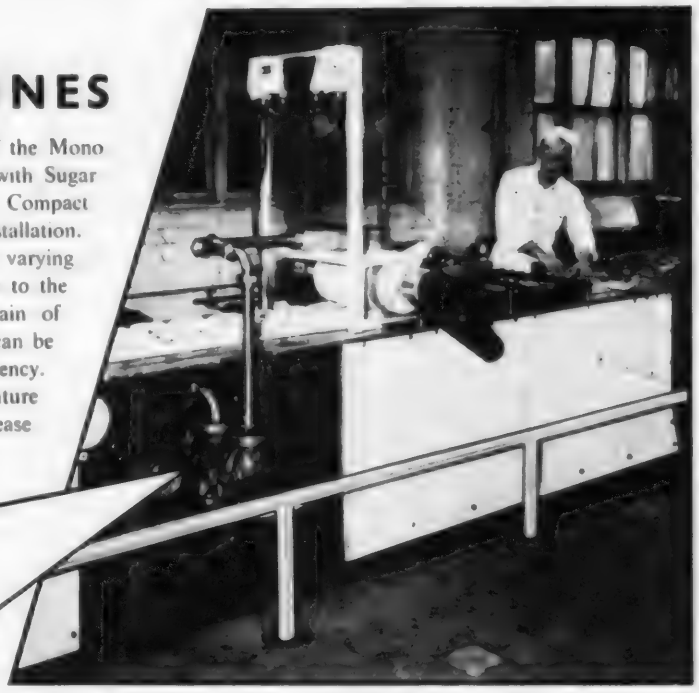

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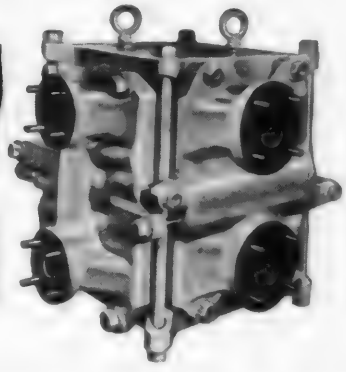

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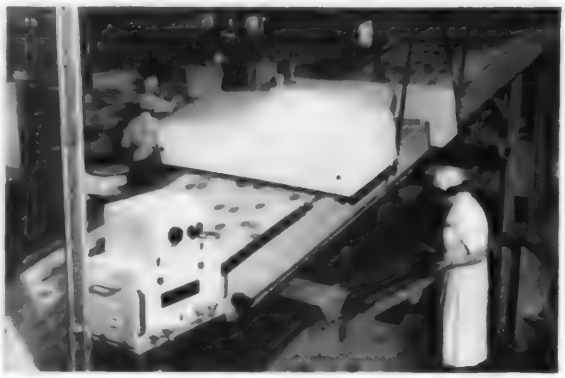

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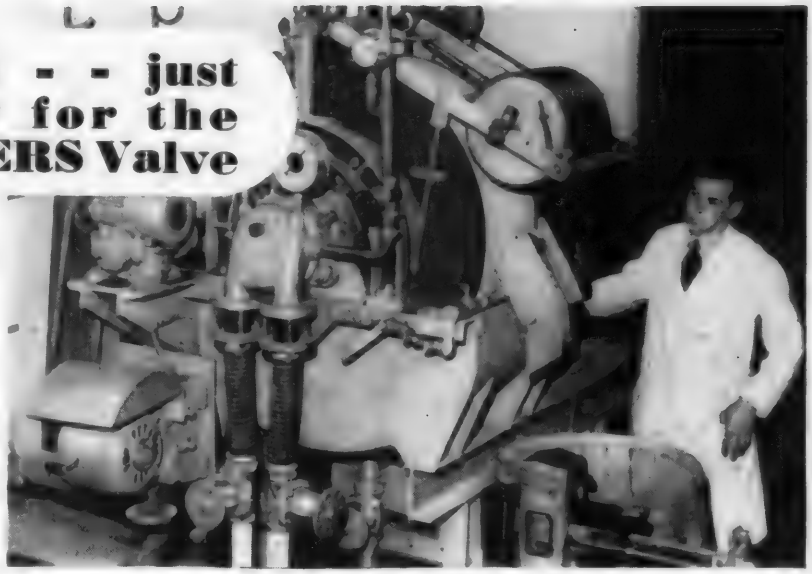

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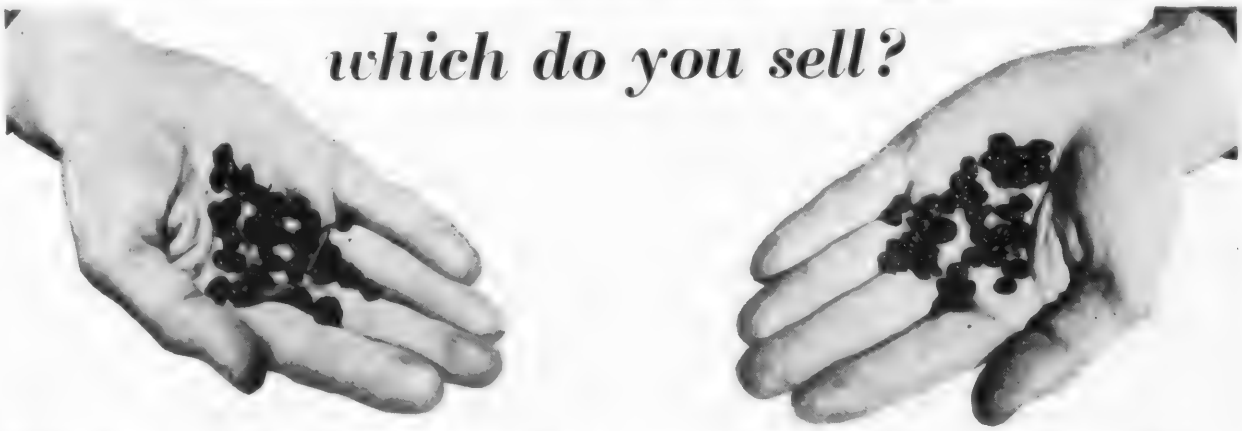

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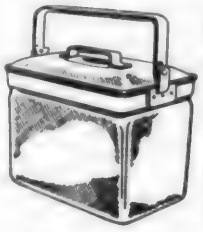

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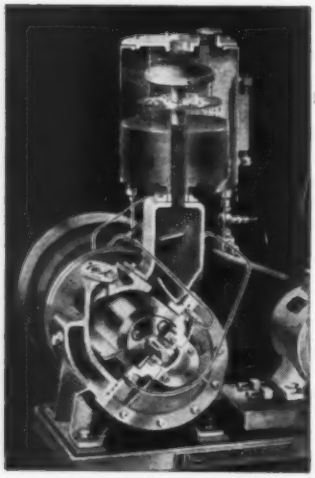

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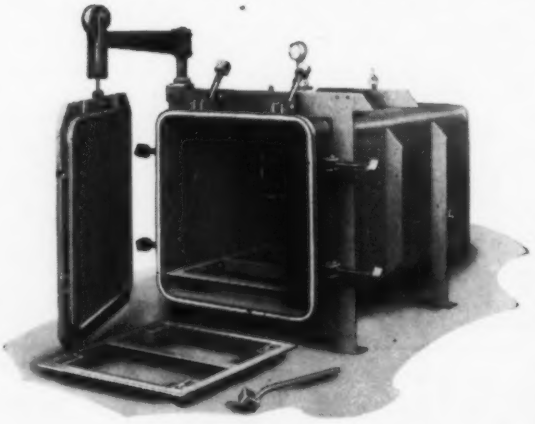

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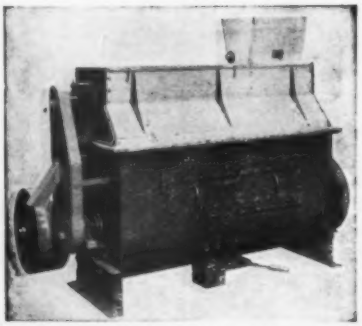

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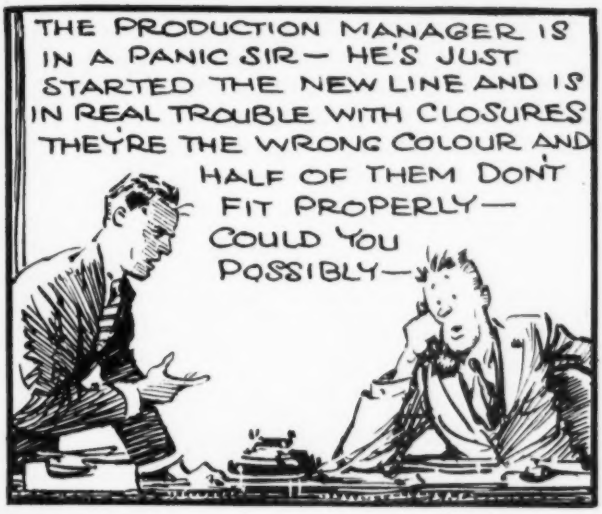
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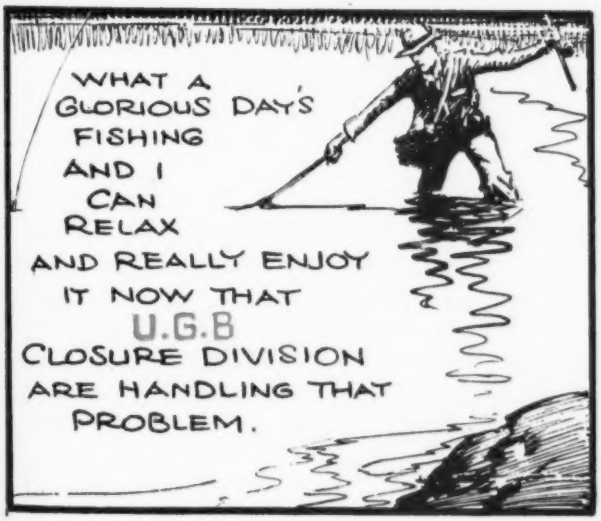

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